# JOURNAL

OF THE

# Agricultural & Horticultural Society

OF

# INDIA.

---

EDITED BY

*THE COMMITTEE OF PAPERS.*

---

## VOL. XI.

JULY, 1859, TO APRIL, 1861.

ORIGINAL COMMUNICATIONS.

"A body of men engaged in the same pursuit, form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all."—REV. DR. WILLIAM CAREY.

Calcutta;

BISHOP'S COLLEGE PRESS.

M.DCCC.LXI.

# THE JOURNAL

OF THE

# Agricultural & Horticultural Society

OF

# INDIA.


---

## *Notes on the Silkworms of India: By Capt.* THOMAS HUTTON.

The origin of those domestic animals which have so materially contributed to the comfort and well-being of mankind has long been a subject of interest and research among inquiring and scientific men, and while in many instances such origin has, no doubt, been very satisfactorily and conclusively ascertained, there are still many species whose descent from any of the presently existing wild races appears to be more than doubtful, and resting solely upon supposition.

There appears, indeed, to be a very fashionable opinion that some actual Scriptural necessity exists for referring such origin to the wild races of the present day, and we seem to be altogether most unreasonably unwilling to admit, even as a probability, that such species as the Almighty saw would be conducive to man's welfare in his primæval state, were at once, *ab initio*, placed under his command and control.

And yet, if we are to believe, as believe we must, in the truth of the earliest records of the history of our race, we must assuredly perceive that ample grounds exist for maintaining such an opinion, inasmuch as the early typical sacrifice which was instituted at and consequent upon, the Fall, necessitated, at least, the acquisition of a sufficient stock of sheep to enable the early fathers to meet the expenditure thus entailed, and it is contrary to all probability, if not likewise, to *possibility*, to imagine that the daily victim was obtained by the chase and capture of the wild races.

This fact alone is of itself sufficient to convince any reasonable minded person that some, at least, af our domestic stock is not referrible to any existing wild races, but that on the contrary they have been retained by man in a state of captivity and servitude since their creation, and previous to the Fall.

Yet it is at the same time most undoubtedly true, that others are referrible only to wild stock reclaimed from a state of Nature, while there are yet some whose origin completely baffles us,—more, probably, from our inability to penetrate into the countries which form their natural habitat, than from any other cause.

Among those whose origin is well known may easily be recognised the turkey of America, the Guinea fowl of Africa, the rabbit of Europe, the peafowl, and perhaps, (although this has not, I think, been yet satisfactorily proved) the jungle cock of India. (*G. ferrugineus*).

These have all, from time to time, been reclaimed by man, from a wild state, in order to satisfy his increasing wants, or to administer to his luxury.

And here another interesting subject of inquiry is opened up by the fact, that the wild species above enumerated, are for the most part, in their natural state, restricted to certain countries from which, without the aid of man, they

are incapable of removing; thus clearly proving, that they have not only not wandered to their present habitations from any central focus, such as that which Armenia would have furnished, but that they must have been created in, and for, those climates and localities, in which alone, while in a state of nature, they exist.

In the case of the wild turkey, this seems to be at once conclusively demonstrated by the fact, that it has not only left none of its race behind it in those countries from which, and through which it must have passed, but likewise that being a bird of short and heavy flight, it could never have crossed the seas to its present habitation.

Hence from this, and many other similar facts, which could be adduced, a question arises as to whether all the existing species of the world were included, according to the popular opinion, in the list of Noah, or whether they have, with the exception of some few domestic species, been especially created in, and for the localities to which in many instances Nature has absolutely restricted them.

In respect to numbers of the wild races, it can, I think, be satisfactorily shown that they were created in their present habitats, for under any other supposition how did the Polar bear and other Arctic animals contrive to find their way to such regions, if they had actually descended from the Ark on Ararat?

So that, all things considered, a strong argument arises in support of the opinion that the animals taken into the Ark were chiefly, if not solely, such as were foreseen likely to be useful to man in his post-diluvian condition, while the wild races of the present time, and assuredly so with regard to the carnivora, were created in and for, the lands as they successively arose above the surface of the water, as the Deluge abated.*

* See the point discussed, Chap. xxviii, p. 398, of "The Chronology of Creation"

Now among the creations of the post-diluvian era, I am strongly inclined to number the existing species of those valuable and interesting insects, the history of which I shall endeavour as much as possible to unfold in the following pages; and, indeed, with regard to those Bombyces which yield several crops of silk during the year, that very habit alone seems to furnish ample evidence that they at least did not exist among the animals of the Ark, for in such case how were they nourished? They could not have been preserved in the egg, because not being annuals they would have hatched and died for want of nourishment, while even as regards annuals the case is little different since Noah must have been at least a full year shut up in the Ark. Moreover as the patriarchal year is said to have commenced in September, and it was on the 17th day of the second month that Noah entered the Ark, it is clear that even annuals would have hatched and died for want of food also. It will not do to cut the Gordian knot by declaring that the Almighty could have preserved them had He thought proper to do so by some means unknown to us, for we are not in cases of this kind authorised to escape from a difficulty by saying, "God *could have done* so and so,"—since we cannot be guided by what He undoubtedly *could have done*, but by the simple facts narrated, and by what under all the circumstances of the case it is most probable that He *did do*.

But if, notwithstanding these proofs to the contrary, it still be contended that the species are antediluvian, and were *miraculously* preserved, then the only means by which they could have found their way to China, was by the aid of man, and must have been effected through the instrumentality of that tribe which departed from the Armenian plateaus under their Chief Fohi about 2,953 years before Christ, or about 300 years after the Deluge.

Even in this case, however, it has to be shewn how they were fed and cared for during that time, seeing that the

mulberry tree did not find its way westward for many a century after that; and indeed the supposition of their having been thus preserved appears under all the circumstances of the case, to be so absurd, and even so impossible, that I shall dismiss it as unworthy of more serious attention; for the very same difficulties in regard to food would have attended the Chinese while *en route* as would have been experienced in the Ark itself, and that simply because in neither could there possibly have been any food at all! Thus it becomes evident, that these worms which have hitherto been confounded together under the designation of *Bombyx Mori*, or Mulberry Moth, are indigenous to China, and were created in, and for that country after the Deluge had subsided.

If, however, it be contended that our domestic silkworms are unknown in a state of nature, then one of two things necessarily follows, namely, either that the assertion is made in pure ignorance of whether it exists, or not, or the Chinese have succeeded in clearing the trees of the whole race, and have reduced it to a state of domestication.

I incline altogether to the former alternative, and would simply remark that so little is really known either regarding the districts from which the worms were originally obtained, or regarding the insects themselves, save that their product of silk is valuable in a commercial point of view, that it would amount to sheer arrogant presumption to declare in the present state of our knowledge, that the worms are not to be found in a state of nature. The utmost that appears to be really known, is that the silkworm was, at some remote period, imported from China; but whether from its native district in that country, or whether it any where occurs wild within the limits of the Celestial Empire, are questions which neither cultivator nor naturalist can at present decide.

But it is time to lay aside conjecture, and to inquire more particularly into the history of each individual species, since

by so doing, I am fully persuaded it will be found that, instead of *one species* of mulberry silkworm, we have several doubled up and confounded under the name of *Bombyx Mori*. So similar, however, are the moths produced from each kind, and so true is it, that the description of one, with the single exception perhaps of size, might serve for all, that it is only by attentively watching the changes which the larvæ undergo, and comparing the one with the other through every stage up to the imago, or perfect insect, that the question of identity, or of distinctness, can be satisfactorily solved.

Although silk in its raw state, and as an article of commerce is said to have been known to the Greeks from the time of the conquest of Persia by Alexander the Great, and is thought by some to have been the Golden Fleece which Jason and his Argonauts procured from Colchis, yet it does not appear that the insects which produced it were themselves introduced into Europe before the time of Justinian, when the eggs, inclosed in hollow canes, were brought from China across the Himalaya mountains to Constantinople, by two Persian monks. This is at least the usual account, although M. Boitard, a French writer on this subject, informs us that the monks obtained the eggs from Ser-Hind, or Sirhind, in the North-Western Provinces of India. Whichever be the case, the fact is of itself, I think, sufficient to disprove the assertion that the worms were reared by the Persians previous to the Christian era, and were not permitted, on pain of death, to be exported, nor any person skilled in their management to pass westward; for had the silkworm been then known and cultivated, either in Persia, or the neighbouring kingdoms, it is scarcely possible that so strict a watch could have been maintained as to prevent the eggs, for which any price would have been given, from being smuggled into other lands, nor would Persian monks have brought from China across the rugged chains of the frozen Himalaya, exposed as they must have been to the greatest

hardships and rigors of climate, that which they already possessed in abundance in their own country!

Yet it is alleged by some writers that Justinian endeavoured to obtain the worms from the Persians through the friendly assistance of the Christian monarch of Abyssinia, but failing in this attempt, he then obtained them from China, by employing two monks, who had been attached as missionaries to some of the Christian churches.

These churches, we are then told, had been established in different parts of India, and the monks employed in them had penetrated into China, where they observed the labours of the silkworm, and learned the mode of rearing them; and that "the prospect of gain, or perhaps an indignant zeal, excited by seeing this lucrative branch of commerce engrossed by unbelieving nations, prompted them to repair to Constantinople, where they explained to the Emperor *the origin of silk*, as well as the various modes of preparing and manufacturing it, and that encouraged by his liberal promises, they undertook to bring to the capital a sufficient number of those wonderful insects." *(Dewhurst on the Silkworm.)* This account appears at once to refute itself, when we reflect that the monks, knowing, as they did, the vast importance of silk, actually travelled *empty-handed* from China to Constantinople for the mere purpose of telling the Emperor where the worms could be procured, as well as to explain to him "*the origin of silk*," since his attempts to introduce the insect from Persia is at once sufficient evidence that he was already aware of that origin, and we can scarcely imagine that "*monks of old*," who are, on all sides, reported to have been "*a jovial crew*," were such arrant dolts as to undertake *two* such toilsome and hazardous journeys when one would have been sufficient. Besides which why could they not have gained all this information regarding the rearing of the silkworm in their own country, instead of seeking for it in China?

Moreover it would also appear from the statements of this same author, that the mode of manufacturing the silk was known to the Greeks as early as the time of Alexander, since he informs us that—"when it was introduced into Greece by Alexander the Great, the manufacture of it was confined to Berytus and Tyre in Phœnicia, from whence it was dispersed all over the West." But as Tyre was taken by Alexander the Great 332 years *before* the birth of Christ, it must be evident, if this statement is to be relied on, that the manufacture of silk was known in Europe long previous to this alleged visit of the monks in A. D. 527, and that our author's first declaration is but a flat contradiction of the other.

All things considered, therefore, I feel myself justified in adhering to the opinions most generally entertained by writers on the subject, and accordingly adopt the views of those who state the eggs of the silkworms were first introduced into Europe in the reign of the Emperor Justinian by the aforesaid monks; and as it is wholly contrary to reason and to probability, to imagine that they would have sought in China for that which they could have equally well obtained in their own country had the worms been then domesticated there, so to say the least of it, does it appear highly probable that the worm was then unknown out of the Celestial Empire, and was neither to be found in India, or in Persia, although the mode of manufacturing silken goods had probably long been known in both.

As to the particular part of China from whence the insect was originally obtained, the very fact that the monks are said to have crossed the icy regions of the Himalaya, at once declares that their treasures were procured from the Northern districts, and, indeed M. Boitard, in his valuable "*Treatise on the Culture of the Mulberry tree and Silkworm,*" does not hesitate to affirm that—"Count Dandolo erred when he said that the silkworm originally came from

the southern provinces of China; since it is now well known that it was, on the contrary, in the northern districts of that vast empire that the domestication of the insect commenced. The province of Tche-Kiang was, moreover, that in which the people from the earliest times devoted themselves most generally to the cultivation of these insects, so that from the very highest antiquity that province was able, single-handed, to supply the whole empire with that precious commodity."

He then proceeds to state that "the Chinese, not finding a sufficient consumption of the article at home, sallied forth from behind the Great Wall in order to exchange their silk for the perfumes and the spices of the Hindoos. The superb climate of the Gangetic Provinces was far too favorable for the culture of the silkworm for the people to remain long indifferent to the advantages to be derived from the introduction of this new species of commerce, and accordingly in spite of all the precautions of the Chinese, the mulberry tree and the silkworm were speedily acquired and introduced to increase the riches of the fertile plains of Hindostan.

The Hindoos, again, in their turn carried their traffic into Persia, where the Persians acted by them the part they had previously played with the Chinese; but it was not until after the conquest of the East by the Tartars that they began to reap the full benefit of their industry, nor was it until that time that the Persians profiting by their military influence secured to themselves the lion's share of the trade in silk.

Be this, however, as it may, the town of Turfan, in Little Bucharia was for a long time the rendezvous of the caravans coming from the West, and the principle entrepôt for the silks from China. This town was the capital of the Seres of Upper Asia, or of the Serica of Ptolemy. Driven from their country by the Huns, these people established themselves in Great Bucharia [*Bokhara?*] and in India, where they founded among other colonies, that of Ser-Hind in the ancient

kingdom of Delhi, where they applied themselves assiduously to the rearing of silk-worms. Until that time silk was almost unknown in Europe; the Romans under the Republic, only knowing it as a curiosity. Pompey after the conquest of Asia introduced the use of it, but the price was so exorbitantly high that it actually sold for its weight in gold; and even in the third century, the Emperor Marcus Aurelius refused to listen to the urgent entreaties of his wife for a silken robe. It was not, indeed, until the fourth century that the price began to abate, though it still remained for nearly 1000 years longer, in some parts of Europe as high as 1,200 francs, or 50£ sterling per ℔, and every one knows that Henry the Second was the first person in France who wore silk stockings.

During the whole of this time the silks which were imported into Europe, and the use of which was restricted solely to the Romans, were obtained from Ava, or from China, and arrived at Constantinople by way of Egypt; and it was not until about 555 of the Christian era, that the insects themselves were introduced into Greece by the Emperor Justinian.

The most remarkable circumstance, perhaps, as connected with the history of silk is, that for six hundred years the culture of the mulberry tree and of the silkworm was entirely confined to Greece without spreading into other parts of Europe, and strange to say when at last it did emerge, it was to Arabia that it found its way. After that, it was introduced in 1130 by Roger King of Sicily into Palermo, from whence both the culture of the tree and of the worm spread successively into Spain, Italy, and France, and in short wherever they were thought capable of thriving."*

With regard to Sirhind, in the Puteeala State, being the place at which silk was first introduced into India, I am,

* Translated from M Boitard's "*Traité du Murier et du Ver à Soie,*" *pp.* 157 – 160.

notwithstanding the weight of tradition, somewhat inclined to be sceptical; the name of the place may very possibly have furnished some marvel-monger with the idea that *Ser* or *Sir* meant *Seres,* and so tempted him to imagine that the place was once famous for its silk,—though had such been, indeed, the fact, what, it may be asked, has become, not only of the silkworms, there said to have been so long domesticated, but of the thousands of trees that must have been required for their nourishing? Echo seems indeed, to answer "*Where*" ?—and I must confess that, like Mr. Cope, I am inclined to regard the statement with suspicion, for the word which is said to have been *Ser-Indi,* appears much more likely to have been, from the position of the town in Upper India, *Sir-i-Ind,* or *Sirhind;* that is "*at the head,* or *upper part of India,*" than *Hind of the Seres,* or Chinese!

I should feel much more inclined to believe that the worm had been introduced from the North into Cashmere, at a time when the country was independent and under the sway of the Hindoos, the greater part of the people being still of that persuasion. Cashmere, indeed, is said to have been an independent kingdom up to the 13th or 14th century, when it was subdued by the Guznevides, and on the subsequent overthrow of the Kingdom of Delhi, the Afghans took possession of the Province, and held it until dispossessed by the Seikhs under Runjeet Singh.

But however this may be, "China was undoubtedly the country in which men first availed themselves of the labours of the silkworm. Serica (the country of the Seres) was a name by which the Macedonian Greeks designated the country which produced the silk that came overland from *the North of China.* The author of the "Periplus of the Erythrœan Sea," speaks of silk in Malabar as an article imported from countries farther to the East, from which it may be inferred that the culture of the silkworm and

the manufacture of silk had not been introduced even into India four hundred years after silk was known in Europe.

The Persians monopolised the supply of *the raw material*, and guarded their trade with so much jealousy, both by land and sea, that travellers from, or to China, were not allowed to traverse the Persian dominions; and in the time of Justinian, in consequence of some interference with the trade, they had entirely stopped the importation of silk. Things were in this unsatisfactory state, when two Nestorian monks of Persia who had travelled to China, acquainted Justinian with the mode of producing silk, and undertook to return and bring back with them some of the eggs of the silkworm."*

This after all is, I think, the most probable and rational account of the matter, and hence we appear to gather from these several narratives that at all events *the silkworm* in the time of Justinian was not cultivated out of China, but was then carried westward from the northern provinces of that empire, and it appears that even in the present day the silks which are exported from that country are brought down from the interior in bales, and sold at Canton to the British, Dutch, and French merchants.

The particular species thus derived from the northern parts of China, and to which the distinctive appellation of *Bombyx Mori* has been assigned, is evidently from the various accounts given of its habits by entomologists and cultivators of silk, an annual worm yielding but one crop.

In his remarks on the rearing of silkworms, Dewhurst clearly shows that his description refers to an annual when he loosely observes that it "*dies annually*;" by which, however, he merely means that the operation of making silk is only performed once in the year, since he afterwards proceeds

* Art: "Silk," *Penny Cyclopædia.*

to say that after the eggs have been deposited they are kept in a cool place until the following season.*

M. Boitard, likewise, describes the same species; while that it was an annual which Kirby and Spence regarded as the true *B. Mori*, is proved beyond a doubt by their saying, after some remarks upon it, "other species, as may be inferred from an extract of a letter given in Young's *Annals of Agriculture*, are known in China, and have been recently introduced into India. 'We have obtained,' says the writer, 'a monthly silkworm from China, which I have reared with my own hands, and in twenty-five days have had the cocoons in my basins, and by the twenty-ninth, or thirty-first day a new progeny feeding in my trays.'"†

This at once establishes the fact that the monthly worms were not known in India earlier than between thirty and forty years ago; for that they were, at least, not cultivated there is shown when the same writer adds, "This makes it a mine to whoever *would undertake* the cultivation of it."

Here, then, is direct proof that previous to the time here indicated, an annual worm, and it only was the species under cultivation both in India and in Europe, and consequently that it is the true *Bombyx Mori* of Linnæus.

But now a question arises as to what annual the name applies, since there are very strong reasons for believing that there are two annual worms, unless, (which I hardly think will prove to be the case) the one, should turn out to be a degenerated variety of the other. These are, first, the annual worm, with white cocoon, known in Bengal as the *Boro poolo*, and said to be domesticated in China, Bengal, France and Italy; while the second is the Cashmere, Afghan(?) and Persian(?) worm.

* *Treatise on the Silkworm*, p 15, by W. H. Dewhurst, President of the Verulam Society.

† Kirby and Spence's *Introduction to Entomology*, vol. 1, p 335.

The first of these appears to be fast disappearing from Bengal, if we can depend upon Mr. Bashford's remarks already published in a previous volume of this Journal; and judging from a list of desiderata received not long since from M. Guerin de Meneville, I am inclined to think that the species is not much known in France, since he says *in epistolá*, "les diverses especes que je desire sont: 1° *Le Grand cocon Annuel*, qui n' est élevé qù une fois par au et qu' on recolte en Mars."

It is, however, quite possible that he may have been misled by the flaming Report entitled "A Synopsis on Bengal Raw Silk," by M. L. Nerac, and drawn up, it is said, by order of the East India Company, for the cocoon of the Bengal annual is not to be compared in point of size to that of the Cashmere worm, and which I strongly suspect is the species domesticated in France, and whose cocoons so much astonished Mr. Bashford. In the event then, of the Bengal annual being little known in Europe, the Cashmere species will be entitled to the name of *Bombyx Mori*, while the former will either prove to be a distinct and unnamed species, or a degenerated variety of the other.*

The monthly worm alluded to above, as having been introduced from China, is doubtless that to which the name of *Madrassee* has been applied, and to which, as an undescribed species, I have provisionally assigned the name of *Bombyx Crœsi.*

That the Cashmere silkworm will, in all probability, prove to be the true *B. Mori*, need not surprise us, if the story of its introduction, into Europe be correct, since having once been established in Cashmere from northern China, it would easily find its way through Afghanistan into Persia, and may be the species which the monks are said previously to have introduced into Constantinople; for the present, however,

* I have requested Mons. Guerin de Meneville to let me know which he considers as *B. Mori*, and to send me eggs and cocoons.

the question must remain unsolved, and can be more fully entered upon when I come to speak more particularly of each individual species.

The reason, probably, why the *Bombyx Mori* is said to be finer in the countries of Europe than in Asia, is to be attributed to the fact of their climates more nearly approximating in temperature to that of the natural habitat of the insect, than does the fervid climate of the plains of India; and, indeed, this may be said of all the species now domesticated in Bengal, where the climate being totally different from that of the provinces from whence the worms were originally procured, may have a most debilitating and deteriorating effect upon the constitution of the insects, showing itself in the inferior size and quality of the cocoons as compared with those of Europe.

That Bengal *is not a country adapted to the constitution of* the mulberry silkworm many facts concur to establish, notwithstanding Mr. Bashford's assertion to the contrary! I am of course quite prepared to hear the silk cultivators of Bengal raise their dissentient voices to this opinion, but let me ask them, whether the dogs which they import from northern climates are found to thrive as well in Bengal as beneath their native skies,—nay do we ourselves thus thrive? And if not, then how can it reasonably be expected in regard to the silkworm, for that it was originally from a Northern district of China is now too well known to be denied, and consequently it is not to be wondered at that insects from a northern clime should give signs of degeneracy in the damp and glowing climate of Bengal. The wonder rather is that men should ever have expected the worm to retain a healthy constitution, and come to any degree of perfection under such a system as that which has so long been followed.

But however loud the outcry may be against the assertion that the produce of the worms in Europe is superior to

that of Bengal, we have nevertheless two witnesses to the fact in Mr. Bashford, late of the Surdah Filatures, and Count Freschi lately arrived from Europe, the latter gentleman declaring the Bengal cocoons to be absolute "*trash*" as compared to those of France and Italy. Dr. Helfer, likewise, long ago informed us that "many have made the objection that the silk of the Indian species is much inferior" to that of Europe, and he adds, "the mulberry silkworm degenerates if not properly attended to."*

With regard to the testimony of all those witnesses, however, although they roundly assert the superiority of European over Bengal cocoons, (and I can readily believe such to be the case,) still it is very necessary to receive their evidence *cum grano salis*, since the comparison does not appear to have been properly instituted; that is to say, confounding one species with another, and doubling all up under the one *Bombyx Mori*, the comparison is made not between the silk of the same species reared in the different countries, but between the silks of totally distinct species, and hence the conclusions attempted to be drawn are perfectly erroneous. Mr. Bashford, not distinguishing one species from another, informs us that 10,000 of the best cocoons of Bengal produce no more than do 2,500 cocoons of the French cultivators, he then launches off into ecstacies at the great superiority of the latter. Had this vast difference obtained between silks produced in the two countries by the same species, then no doubt there would have been just grounds for praising the French produce, but unfortunately the laudation and the comparison both end in smoke, when it is considered that Mr. Bashford has merely found out that 10,000 cocoons of *the Madrassee* or monthly Bengal worm, are only equal to 2,500 cocoons of *the French Annual*, the cocoons of which are naturally double or treble the size of the other ! Indeed

* *Journal Asiatic Society*, vol 6. p. 46.

wherever Mr. Bashford is tempted to launch forth in praise of the very large size of the French cocoons, I cannot help thinking that the species referred to is the Cashmere worm, the cocoon of which is by far the largest of any of the genus that I have yet seen, many of them not falling very far short of the cocoons of the Bengal Tussur (*Sat. Mylitta?*)

Be this as it may, one thing is at least abundantly certain, namely, that there exists an abundance of facts to prove that the silkworms reared in hot climates like that of Bengal, and under the artificial system there adopted, are inferior in health, vigour, and produce to those of more Northern and temperate climes. Mr. Bashford himself proves this when he says, "all our worms in Bengal for filature silk give us several crops of cocoons during the year, except a solitary species of annual, origin unknown, *and rapidly becoming extinct.*"

But if this annual is the *Bombyx Mori,* as has hitherto been supposed, then its origin is perfectly well known to have been from the Northern Provinces of China, and its threatened extinction is clearly owing to its being now retained in a climate injurious to its constitution, and reared under a system that gradually poisons it!

The China worms imported by Mr. Bashford for the purpose of crossing with the Madrassee and Desee worm was no other than this same white silked annual, and of it he says, "Silkworms are said to have been originally imported from China. I have lately seen specimens of the best domestic cocoon now reared in that country, but those common in Europe are more than double their size and weight in silk, thus clearly proving that the worm has either degenerated in its natural country, or that European skill has worked the vastly improved change in its nature and constitution."* Much more, however, is proved than Mr. Bashford thinks proper to disclose, for the degeneracy of

* *Journal Agri-Horti Society of India,* Vol. 9, p. 259—269.

the worm in China would go to establish the fact that *domestication* and *a hot southern climate* have done the mischief; and therefore that Bengal, which actually threatens its *extinction* is even worse for the constitution of the species than Southern China! It has yet to be proved, however that this Chinese and Bengal annual is identical in species with the French one; and should they eventually prove to be distinct, then what becomes of all this frequent laudation of *human skill?*

It will doubtless be objected to my condemnation of a hot climate, that the silk of a species reared in northern countries is far coarser than that of worms reared in Bengal, where the warmth of the climate has improved it. But the fact is that this extreme fineness is *unnatural,* and has been induced by artificial means, being, according to my ideas of the subject, *a strong symptom of impaired constitution,* the worm being no longer able to produce a thread of the natural strength and thickness, and this is the effect of what is miscalled *cultivation!*

If it be urged that the fineness of the silk constitutes its value as an article of commerce, then I reply—"Be it so, but don't expect, O silk cultivators, your worms to be free from disease while you continue the present system of rearing them; you are, in fact, *forcing* the insect beyond its strength to produce what nature never intended it to produce, and are thereby killing it by inches. You are not producing a natural, but an artificial silk, and in order to effect this you are compelled to overstimulate the organs of the insect, until you actually impair them and produce disease, and if this is the silk that the state of the market requires, you have but to continue in your present course in order to produce it; but if you require the article in its natural state as produced by a healthy and vigorous insect, you cannot too soon discard your present system, nor seek for a climate and a method of rearing more suited to the

natural constitution and habits of the insect." As long as the present system continues, so long will the worm continue to languish, and it is useless and childish to cry out that it is dying, so long as you persist in slowly poisoning it. No remedy that can be applied will more than temporarily check the evil; and indeed nothing short of its natural climate and food will ever restore the insect to what nature originally intended it to be.

At present the worms are not only reared in a climate inimical to them, the heat of which while it tends to increase the fineness of their thread, is at the same time sapping their constitutions, but they are likewise slowly poisoned by an injudicious system of feeding, for no sooner is the insect disclosed from the egg than, as if the juices of the plucked leaves did not ferment and decay rapidly enough, they are chopped into the finest minced meat for the sole purpose, as it would appear, of accelerating the poisoning process. Why should such a system be adopted? Does nature chop the leaves for the new-born insect when in its natural state? If so, we are justified in a like proceeding; but if not, then is the system both artificial, injudicious, and injurious to health.

That this mincing process is not at all necessary is moreover proved not only from its being contrary to nature, but from the fact that I have invariably reared the young caterpillars both of the wild and domesticated species upon unchopped leaves, and never experienced the slightest difficulty in the matter; all that is necessary is to furnish the young worm with the tenderest leaves, for the simple reason that nature causes the worm to hatch at the very season when the buds of the tree are just bursting into leaf, and thus an abundant supply of the tenderest food adapted to the weakness of the little creature's mandibles, is bountifully and thoughtfully supplied. So absolute is this rule that where eggs of the *Bombyx Huttoni* are found adhering to the bark

of the young cuttings and trees, it is necessary to closely watch for their hatching, in order to remove them to an older tree, since otherwise they will eat into the very heart of the buds, and destroying the heads of the tender shoots effectually insure its speedy destruction.

In Europe so entirely artificial is the method of rearing the insect, that the very hatching of the worm is regulated by the budding of the mulberry tree; nothing could more surely prove the anti-natural condition of the worm than this, since when in a state of freedom the leaves and the young insect burst forth almost together.

How then can we reasonably wonder at the deterioration and sickness of the silkworm, when every step in the process of their education and culture is artificial and injurious, for I do not hesitate to declare my firm conviction that the malady which has appeared among them, whether in Europe or in Asia, has been induced through a long course of the most unnatural and injudicious treatment, which has at length completely undermined and destroyed the constitution.

In the rearing of the silkworm not the slightest attention has ever been yet paid to those conditions which are the most essential to its well being, and which any one but moderately acquainted with natural history would have studied before aught else. These are,

First.—Climate, and the changes in the temperature of that climate, whether sudden or gradual, mild or violent, whether it be subject to much rain, hail and high winds, or dry, placid, and equable.

Secondly.—As to food, with the view of supplying it in the freshest possible state, in sufficient quantity, and a perfectly healthy condition.

If the statistics of the original climate be ascertained, and one similar, or even closely approaching it, can be discovered any where in India, then there can be little doubt that the

insect would take readily to the trees in the open air, and certainly none whatever as to this being the most natural and healthy mode of treating it. Indeed this is one of the methods by which, as we learn from Dewhurst, the worms are still cultivated in China, where "they either permit them to remain at liberty on the mulberry trees, or keep them in rooms. As the finest silk is produced by worms confined in rooms, it will be sufficient," he adds, "if I describe it only."

Now, as in China, the native country of the species, *the finest silk* is produced by worms badly and artificially fed, we are furnished with a further proof of the truth of what I have stated above, namely, that the fineness is one of the effects of unhealthiness, for otherwise we shall be compelled to believe that the further we depart from nature, and the worse the treatment and the food of the worm, the better becomes the silk; but as it is an undoubted fact that the more unwholesome is the food, and the less pure the atmosphere by which the insect is surrounded, the more must the functions and secretions of its system become impaired, so is it once more evident that the extreme tenuity of the silk is a decided symptom of weakness and disease in the secreting glands, and that if that particular quality of the article is desirable, then no remedies can be resorted to for the purpose of restoring the silkworm to its original vigour, without rendering the silk far coarser than the state of the market now requires.*

There appear, in short, just two courses to pursue, namely, either to restore the worms to their original health and quality of silk, or retain them in their present state of discease, with an artificial silk adapted to the tastes and market of the day; and as the former course cannot be adopted in Bengal, so is there no remedy there for the present evil.

* This fineness of the silk is as much induced by artificial treatment, and arises as much from disease as the enlarged livers of ducks and geese, which the vicious tastes of modern gourmands consider such a luxury.

Doubtless the silk-growers of Bengal will here exclaim, that such a system as I propose would be utterly impracticable in that province, as well as in Italy and France, and would insure the speedy destruction of the stock; to which, however, the reply is plain and obvious, namely, "If you cannot rear the insect in those countries, when guided by common sense and nature, it is a clear and convincing proof that your climates are too inimical to the health and well-being of the insect, ever to produce any other results than those you are now deploring. If your climate is such that it will not admit of your treating the worm as when in it's native freedom, then the fact is glaringly apparent that you are endeavouring, *in spite of nature*, to obtain the same results as she does when pursuing a diametrically opposite system. In short you must, with all your "art and cultivation," either consent to be taught by her, and to adopt her system, or be content to jog on with your sickly worms until probably the whole race has become expended." The Chinese have always a vast advantage over other countries, in that they alone appear to possess the means of renewing and re-invigorating their domestic stock, by an influx of fresh stamina from the worms which are reared upon the trees, a kind of recruiting depot, in fact, so that the bad effects arising from the artificial system can easily, from time to time, be in some measure counteracted. In Bengal the attempt has, likewise, sometimes been made to rear the worms upon the trees, but the objection has always been made, that worms treated in this manner produce an inferior silk to those which are reared in the house, and the fact is held up to view as an argument in favour of the artificial over the natural system.

Two things, however, have unfortunately been overlooked in this argument, for in the first place we are not told in what this inferiority consists; and in the second place no account whatever is made of the climate to which the insect

is exposed. If the inferiority of the silk arises from its being coarser than that of worms bred in the house, it is a strong proof that the insect has improved in health and vigour, and the experiment should be carried on for another season, and the moths then crossed upon the domestic stock, in order to infuse fresh life and stamina into them. On the other hand, if it is in quantity of silk that the inferiority consists, then is it solely owing to the fact of the climate being inimical to the creature's constitution, and that exposure to the debilitating effects of such a tropical temperature, and the great changes which often suddenly take place therein, prohibit all chance of the insect, thus exposed, faring so well as that which is protected in the house. It clearly proves that the climate is too hot, and of course that worms in some measure protected from its effects will fare better than those which are wholly exposed; the experimenter alone can inform us which of these constitutes the alleged inferiority.

Trials of this kind, however, made in climates wholly unadapted to the constitution of the insect are not to be regarded as conclusive.

That the great heat of Bengal must act prejudicially, is to be gathered from the fact, that "even the climate of Pekin in China *is much severer than that of Scotland;* and in America not only has the growth of the silk been effected, *but double crops in the course of a single season have been obtained"!* The coldness of the climate appears in this instance to have acted upon the insects as it did at Mussooree, and of which I shall presently have occasion to speak.

Although Pekin is nearly a degree to the south of Naples, the mean temperature of the former is only 54° Faht. while that of the latter is 63°. At Canton, in 1835 snow fell to the depth of 2½ inches. Yet Canton is considerably to the south of the districts in which silk is most generally produced. The climate of the south of China is far too boisterous

for the worm, high winds often turning to perfect hurricanes prevailing as high as Canton, but not proceeding further. It is in districts north of that city that silk is most successfully cultivated, and it is to be observed that all are more or less mountainous; and indeed it is said that more than one half of the empire is composed of mountains and hills, and hence the climates of the northern districts approach more closely to those of the Western Himalaya than to the scorching plains and unhealthy swamps of Bengal.*

That my opinions will meet with little favour from those who are wedded to the artificial system so long in use I am quite prepared to hear, but fortunately I have not now to learn that truths which interfere with our pockets or the customs of the world are seldom palatable, and therefore I shall bear a snubbing with great philosophy; and, indeed, already some little time ago, when pointing out the worthlessness of crossing the various species, a cultivator of some experience sneered at my having, as he angrily termed it, "a fixed idea that Mussooree, or its climate, is the right locality for silk, and the worm in its wild state running loose on the tree the proper state to produce good silk."

Yet when we reflect that within the very confined limits of this mountain settlement, there are no fewer than nine distinct species of the family of the *Bombycidæ*, "*running loose on the trees in their wild state,*" and that some of these produce an excellent strong silk fit for commercial purposes, it is scarcely to be wondered at if I term ours a good silk producing district. The occurrence of so many species is of itself quite sufficient to point out the locality as suited to the silkworm, independent of the very telling fact, that the domesticated Italian stock which is elsewhere merely *an annual*, produced at Mussooree, like the silkworm in America, *two crops of silk within the year*, and that, moreover, without the aid of "*art and cultivation*"! Nor were the worms thus

* Article "CHINA," *Penny Cyclopædia.*

hatched, produced, as Mr. Bashford would infer, from "*a few eggs*" out of the batch, but consisted of *the entire batch itself*, not one remaining unhatched.

But besides that we possess so many wild species of silk-spinners, some of which are closely allied to, if not in some instances identical with those of Northern China, the similarity of our soils and climate to those of the tea-growing districts of the Celestial Empire was one among the reasons, long since pointed out, for regarding the neighbourhood as well adapted to the tea plant. Theory, prejudice, and private interests were quite as strongly arrayed against us then, as now, with respect to the domestication of the silkworm, and yet the successful production of good tea is now "*un affait accompli;*" why, then, may we not be equally successful in regard to silk? I certainly do not expect to see the worms remaining on the trees in a state of nature like those of the indigenous mulberry worms, but I have not the least doubt but that the domestic silkworm of Cashmere, and perhaps others also, may be very advantageously reared in the Deyrah Doon, and lower hills, or that with proper care they will not produce a silk surpassing that of Bengal; for even although we may be compelled to pursue the present artificial mode of feeding, the constitution of the worm will yet be much improved by their residence in a climate so much more closely allied to that of their natural hibitat, than is that of Bengal, or Europe.

Unlike the *Bombyx Huttoni* which appears to set the changes of our climate at defiance, and to thrive as well in the mists of the monsoon as during the heats of the earlier summer months, the worms of China may require a drier clime; and if such be the case, what better locality could a speculator select than that of the dry, warm, sheltered valley of Kunawur?

As to expecting any thing from crossing the different species (unless we except a cross between *Bombyx Huttoni*

and the Cashmere worm, with a view to feeding the progeny on the trees), I formerly pointed out my views on that subject, and the subsequent failure of all Mr. Bashford's experiments was well calculated to prove to him the truth of my opinions, although he did not hesitate at the time somewhat angrily to rebuke me, for what he was pleased to term my desire to "abolish cultivation, art, and every thing that the united efforts of centuries have brought to such perfection in Europe."

Now I will confess to being just so far inclined, "*to renounce the superstition of ages*", as to be willing to undo, as far as my limited means and abilities will permit, the errors and fatal results which "the united efforts of centuries have," according to Mr. Bashford, "brought to such perfection", as to threaten the extinction of the valuable creatures whose lives I am endeavouring to preserve, by proposing the introduction and adoption of a more rational system than that which has brought our cultivators into such difficulties, and I am not the man to give up an argument until it has logically been proved to be erroneous, or to be deterred by the sneers and prejudices of others from following out that course which I consider to be the right one.

I therefore feel inclined to ask my Mentor what he means by *the cultivation of a caterpillar?* In the case of a cabbage, or a turnip, I can readily conceive that an *improved soil,* which furnishes to the vegetable a more nutritious aliment, will greatly improve the plant by imparting vigour, size and flavour. "*Art,*" likewise, may do much in composing suitable soils, and may be advantageously employed in forcing, or retarding fruits and vegetables, so as to produce them at extra-natural seasons, but how, I again inquire, do we cultivate a caterpillar? Does it thrive better upon bad food than upon that which is ever fresh and wholesome; or does it prefer a bad climate to a good one? I must really imagine such to be the case, since the "*Art*"

employed for centuries past in the "*cultivation*" of our silkworms has invariably furnished them with a poisonous diet, which has at length brought them to the very verge of extinction! If decaying leaves are preferable to the fresh ones, and if a state of semi-starvation is more nourishing than one which insures an abundant and regular supply of wholesome food, then, indeed, has art succeeded to admiration in destroying the constitution of the silkworm. Mr. Bashford would thus appear to have made the extraordinary discovery that *the more inimical the climate to the constitution, and the worse the food, the better becomes the silk!*

As to his assertion that in our breeding establishments in England, "horses, fowls, sheep, &c.; every thing is most successfully crossed, *and the improvements are permanent,*" it will require but very little "*Art*" to expose such a pure delusion.

No improvement by crossing is, or can be, permanent, for the simple reason that Nature abhors all crosses and confusion of species, and invariably, sooner or later, reverts to the original stock, hence the necessity for keeping up to a particular standard, by the occasional recrossing of the stock, whereas if such improvements were permanent, there would be no necessity for such recrossing.

A farmer, for instance, wishes to produce a certain breed of short-horned cattle, and having a cow possessed of the desired points, he carefully selects a bull possessing as nearly as possible the very same characteristics, knowing from experience that as "*like breeds like,*" the calf produced will possess the same points as the parents. If afterwards he wishes to keep up the stock to that standard he must again pursue the same system, and if he does not do so, then the so-called improvement, so far from being permanent, will speedily disappear. This is a so well established truth, that it is surprising Mr. Bashford ventured to gainsay it.*

* *Journal Agri-Horti: Society of India,* Vol: 10, pp. 70—74.

That the worms were intended by the author of Creation to remain *upon the trees*, few, I imagine, will be silly enough to deny, and we have proof before us in the fact that *Bombyx religiosæ* (Helf.) of Assam, is found wild upon the *Ficus religiosa* of that district; that *Bombyx Bengalensis* (nob.) is found wild in Bengal upon the *Artocarpus Lacoocha;* and that *Bombyx Huttoni* (West.) which is a true mulberry moth, occurs abundantly on the indigenous tree of the Western Himalaya from the Ganges to the Sutlej, and probably beyond them.*

The same may also be urged in regard to other wild races such as *Saturnia Mylitta*, the Tussur; *Sat: Sivalensis* (nob.) the Sub-Himalayan species; *Sat*: *Canningi* (nob.) the Sub-Himalayan Eria; *Sat: Atlas*, and several other less known species. These are all found wild in suitable situations and climate, and like the Chinese silkworms are yet capable of domestication, and intended to administer to the wants of man; it being nevertheless an indisputable fact that the domestic is never equal in health and strength to the wild stock, and that simply because they neither get their food so fresh and healthy, nor yet in such abundance as when they are left in freedom on the trees.

It may be urged that the cultivator in Bengal can only make use of the climate and the means of feeding which circumstances have placed at his command, and this is doubtless true; but then, good people, why cry out because you cannot with imperfect means, and while labouring under insurmountable difficulties, attain to results which are obtainable only by having all appliances and means to boot? You are evidently striving to propel with the breath of your lips the ship which nothing but a gale of wind can move! You complacently starve and slowly poison your domestic stock, and then wonder that it languishes and dies! You are, in

* There seems to be a most unaccountable idea that it is wonderful to find silkworms on wild mulberry trees! Why so?

short, aiming at pure impossibilities, since healthy worms and a natural silk are obtainable only by pursuing a course which circumstances prohibit you from following. As well might you import the Polar Bear into India, and expect it to thrive on the Hooghly and the Ganges.

But as with the wild races of India, so doubtless has it been with the Chinese species; originally placed by their Creator in suitable climates upon the trees indigenous to those regions, they have been captured and domesticated by man for the sake of the silk which they produce, much in the same manner as we are now preparing to domesticate the Himalayan worm, and whether any are still to be found in a state of nature, or not, no one can at present decide; in all probability they are still to be found in the forests of the Northern Provinces of China, on trees indigenous to the soil and region, a point which it would be highly useful to ascertain, since it is from such wild stock, *and from it alone*, that the establishments of Europe can be effectually recruited.

That the Chinese domestic stock now reared in India, Italy, and France, is suffering from the effects of unnatural treatment, appears to be plain enough, and in order to ascertain how much a want of proper nourishment was instrumental to their deterioration, I instituted one or two experiments at Mussooree with specimens kindly furnished by A. H. Blechynden, Esq., the Secretary to the Horticultural Society of India, and by Henry Cope, Esq. of the Punjab. Indeed, the utter folly of our attempting to compete with Nature by means so inadequate as those at our command was never more completely exemplified than in a trial made both with the Cashmere and Madrassee worms. Having placed an equal number of both these species in my rearing trays, and upon the trees in the open air, I ascertained on the following day, when the worms were just twenty-four hours' old, that those *on the trees* already exceeded *in size* those in the trays *by about one-half*, although the latter had

purposely been bountifully and carefully supplied with fresh and tender leaves; while in respect to the Madrassee worm the first moult of those on the trees in a sheltered spot, took place *two days before that of those in the trays!* This experiment was frequently tried, and always with the same result. Nor is this to be wondered at, when we reflect that the leaves gathered for the house worms began to fade even in this climate as soon as they were cut, and consequently that the juices were in a state of incipient fermentation by the time the worms received them; and not only do they thus receive an impure and poisonous diet, but are stinted likewise, in respect to quantity, since when the leaf has arrived at a certain stage of desiccation, the worm will refuse to eat it, and hence will remain hungry until another supply of partially fermented food is brought from the field or the orchard.

Placed, on the other hand, upon the trees, the worm was not only undisturbed by the changing of the leaves (a very important point when the insect is preparing to moult) but it had ever at command a plentiful supply of the freshest and choicest leaves.

With regard to the rearing of these insects there is also another very important fact, which except among the Chinese, does not appear to have been taken into account, or at least I have never seen it mentioned, which is that the whole of the family of *Bombycidæ* are likewise *night feeders*, and hence the worms which are fed only during the day receive but half the proper quantity of nourishment, and are therefore literally half starved.

Hence probably the great difference perceptible in the size of those experimented upon as above stated, as well as the accelerated moulting of the Madrassee species, these worms from being on the tree having, in fact, although exactly of the same age, been supplied with food for double the length of time of those in the trays. I have frequently

seen the Cashmere and Madrassee worms feeding up to 11 o'clock at night, even in the house, as likewise the Bengal and the Himalayan Eria,—*Actias Selene,* and a large *Saturnia* allied to the Tussur, which is found at Almorah, Mussooree and Simla feeding on the mountain oak. (*Q. incana).* It is easily conceivable therefore that an insect which requires food both by night and by day will not retain its natural strength of constitution, nor yield the proper quantity of silk when fed only in the day time. To test this night-feeding propensity in the genus *Bombyx,* I have often placed worms late at night upon leaves that were perfectly untouched, but which in the morning at five o'clock were completely riddled.

The system of domestication has also another injurious effect upon the creature, since that perfect tranquillity which is so essential to its well-being when about to moult, is completely destroyed by the frequent changing of the leaves; at this time the worms firmly attach themselves by the anal feet to a silken web spun for that purpose, on the surface of the leaf, so that it is either entirely detached from its hold, and rendered unable to shake off, or leave behind it, the old skin, or is probably, when young, often unseen and thrown away with the dry leaves. Much more attention being paid in Europe to these important points than Bengalis are likely to bestow, affords another substantial reason why the cocoons are finer there than in more Eastern countries.

Many worms are also lost by the injudicious method which some persons adopt of detaching the eggs from the cloth or paper on which they had been deposited. When the egg is firmly attached to some substance, the young worm can easily effect its escape from it, leaving the empty shell still adhering, if in a state of nature, to the bark of the tree; but where the egg is loose and detached, it frequently happens that the worm cannot entirely shake off the shell from the extremity of the body, and in such case, after

feeding and wandering about all day with this encumbrance, it dies from the forcible constriction and contraction of the anal segment, which has, in fact, had no room to grow and keep pace with the rest of the body. This I have frequently observed to be the case with eggs kindly sent to me from different quarters for experiment. In France it is usual, I believe, to guard against this contingency, by placing over the eggs a sheet of paper pierced with numerous small holes, sufficiently large to permit the young worms to pass through, and the egg-shells are thus detached from the creature by rubbing against the sides of the holes in its passage through them.

These are all dangers which may be easily obviated by the adoption of a more natural treatment.

Yet notwithstanding this, doubtless some caviller will be tempted to exclaim against my assertion that it is a folly under present circumstances to attempt to compete with nature, and it will be urged that a comparison instituted between our domestic stock and the wild horses and cattle of different parts of the world, must decide the question *against me* and in favour of cultivation. If so, I would simply reply that to compete with nature is not to produce a *new stock*, but to perpetuate *an old one* in as good condition as she does.

No one can deny that the horse, the cow, the hog, &c. may, by a particular mode of treatment, and attention to certain acknowledged rules of breeding, *be converted* into very different animals as to outward form, from their congeners, which remain in a state of freedom; yet this, I beg leave to observe, *is not competing with nature*, for nature never attempts to alter a species! Our domestic stock consists generally speaking of *artificial breeds*, purposely so bred, on certain recognised principles, and for certain purposes; but except that they are still cows, horses and pigs, nature has had no more to say to the production of their

peculiarities of form, than she has to the hideous deformity exhibited in the equally artificial and wasplike waist of a modern belle!

By "*Art,*" and by what are technically termed the rules of breeding, we have, no doubt, the power to effect strange changes in the outward form, by converting a species into something altogether at variance with its natural condition; but this, I again repeat, is not competing with, but is a perversion of, Nature. Precisely, then, as we have the power, by artificial treatment, to produce "*Long Horns,*" and "*Short Horns,*" "*South Downs*" and "*Leicestershires,*" and even to enlarge (shall I say *improve?*) the livers of unfortunate ducks and geese, have we likewise the means, by rendering the silkworm unhealthy, of producing that particular degree of fineness in its silk which the state of the market requires; let us be careful, then, that we do not end by rendering the silk so fine *as to become altogether invisible,* for it is to this that we are evidently fast drifting, under the combined effects of "*art*" and "*cultivation.*"

Before concluding this part of my subject, I would beg leave to observe that Nature, in the sense in which it is here necessary to use the word, is only another name for Nature's God, and consequently it is not by contending with and attempting to teach Him, that we shall succeed in producing good silk, but by attentively considering, and as closely as possible imitating, His proceedings, and so profiting by the great skill and wisdom which are every where apparent in the wide-spread pages of Nature's book, as in some measure, to make them our own.

Cultivators of silk, however, appear to have entirely forgotten this important truth, and are seemingly inclined to say to Nature "*copy us*"!

It is perfectly apparent, then, that notwithstanding all the care and attention bestowed upon the rearing of these insects in Europe, a malady has at length overtaken them

which fairly threatens their extinction, and as it may be expected that I should offer some few practical suggestions for the purpose of remedying the evil, I shall now as briefly as possible, proceed to do so.

The worms, then, we are all agreed, are not with us in a genial climate; they are inhabitants of the mountain forests of the North of China, and we wish to profit by their introduction into India and Europe. Coming as they do from northern districts, it is to be expected that they will thrive better in Europe than in Bengal, or Southern India generally, and this has always been the case, independently of the fact that in Europe greater care has been bestowed upon their education than among the lazy, listless population of the East.

Yet notwithstanding all our care, the insects have degenerated both at home and abroad, until at length we are threatened with their total loss. Where and what is the remedy for the evil?

In my opinion there is but one, and that one must be but fleeting in its effects, unless we choose to be guided in the cultivation of the silkworm by the same rules which bind us in producing our other domestic stock.

Up to the present hour we have gone on "breeding in and in," until we have succeeded in establishing a race, or races of insects, whose constitution is thoroughly worn out by the artificial treatment to which out of their own native country they must of necessity be subjected.

I have already pointed out in the preceding pages that in all our breeding establishments the occasional influx of fresh blood is necessary to perpetuate and strengthen the constitution; and as agriculturists, the Society must be well aware that the very same rule obtains with regard to the cultivation of certain vegetables, fresh seed being absolutely necessary when the stock, as often, for instance, with the potato, has become weakened and impaired. It must ever

be borne in mind that all our domestic, or cultivated stock, whether of animals or vegetables, is more or less in an artificial state, and that what we are pleased to call *cultivation*, is in reality a system of *forcing* the animal and vegetable functions into *extra-natural* excitement and exertion, until at length the machinery breaks down by the destruction of the creature's constitution.

Hence the great and absolute necessity for occasionally renewing the strength of that constitution by the intermixture of a more natural blood or sap, as the case may require.

With respect to the silkworm the chief things to be attended to in its domestication, are first, *temperature;* secondly, shelter from gales of wind and sudden changes; thirdly, light and air, or free ventilation; and fourthly, the freshest and healthiest food in sufficient abundance both by day *and by night.*

The temperature should of course be regulated as much as possible to resemble that of the insect's native land, the chief thing, apparently, being to avoid too great a degree of heat during the day, and to gradually diminish the temperature as evening and night draw on without actually rendering the rooms too cold; in short, the mean temperature by day and night of the silk-growing districts of China should be carefully ascertained and introduced.

Secondly, care should be taken that the rearing-houses are as little as possible exposed to gales of wind, and a good look out should always be kept against sudden changes of temperature, in order that the doors and windows may be closed in time against an unexpected squall.

Thirdly, free ventilation of air and the admission of strong sun-light are indispensable to the well-being of the silkworm, the first to carry off and dissipate all noxious effluvia, and the second to give life and vigour and enjoyment to the worms without their being incommoded by the heat of its direct rays, since when in a state of freedom on the

trees, they will shelter themselves during the middle of the day, by reposing on the under side of the leaf, which is thus used as a moderating screen.

Fourthly, as to food; the best that can possibly be procured, both as to freshness and quality, and the rearing houses should therefore always be erected in the midst of the plantation, in order to prevent the leaves from withering or becoming flaccid before they reach the insect. Quality can always be regulated by attention to the soils in which the trees are grown, and an analysis of the leaves growing in different soils and situations should from time to time be made and recorded for comparison; and the quality be kept up to that standard which was found to suit the insect best.

In regard to quantity, no more should be given at one time than the worms can easily consume, but they should be carefully supplied *during the night*, as well as in the day, for all are night-feeders; and if stinted in this respect semi-starvation will be followed by a weakened constitution.

Tranquillity is also desirable, and at the seasons of moulting is absolutely essential to the creature's existence, for if then disturbed and detached from its silken hold upon the leaf, it will, in nine cases out of ten, be unable to shake off its worn-out garment, but will die in its efforts to do so.

Other points of minor importance there doubtless are which experience will teach the cultivator to attend to, and which perhaps do not fall to the lot of the naturalist to describe; but there is, nevertheless, still one of the utmost importance, and the proper observance of which cannot be too much insisted upon, and that is the occasional renewing of the stock by crossing it with worms *periodically imported in the egg, from the trees of their native land.* Not, be it observed, once in a way, when, as at present, the worms are next thing to useless, but *systematically* at certain intervals and as a necessary part of silk cultivation.

Unless this be done, it will be utterly in vain to attempt to stop the progress of the disease which now threatens the destruction of this valuable insect, and surely if it be worth retaining it must be worth the trouble of occasionally securing a fresh supply of eggs from the native haunts of the species.

This I must candidly confess is in my opinion the only remedy that promises beneficial and durable results.

To seek as Count Freschi is now doing, for fresh stock from India is but adding fuel to the fire, since no country in which the worms have been long kept in a state of artificial culture can produce a healthy stock, or at least not sufficiently healthy to enable it to renovate that of any other land. In fact, the silkworms of India are as much under the influence of disease as those of Europe.

The proof of this assertion is now, and has been for months past, before me in sheets of paper covered with eggs of various colours, the produce of the Bengal annual, or Boro-poolo. These have been kindly furnished to me by Mr. A. H. Blechynden, who, I imagine, when he supplied me with the first batch in December last, little suspected the presence of any disease at all; yet out of the numbers attached to those papers, the greater part were of an unnatural colour, such as vinous red, deep chocolate, and even livid green. The worms that were hatched were chiefly from the lilac grey eggs, but there were several also from the green ones; none of them, however, fed healthily nor did they survive beyond a fortnight. The vinous red and chocolate coloured eggs produced no worms at all.

Another batch of eggs deposited on the 22nd of March in Bengal, reached me on the 28th of that month, and are still *in statu quo*, red, chocolate, livid green, and lilac grey being the colours. Also a piece of cloth from Moorshedabad densely covered with eggs, and received on the 5th of May, are decidedly diseased, having the very same colours as the previous batch.

Count Freschi is not, therefore, very likely to find the means of recruiting the constitution of his Italian worms from crosses with the Bengal stock, nor do I think he will be altogether successful even in Cashmere, since a batch of eggs of the Cashmere annual received from the Agri-Horticultural Society of the Punjab, out of many thousands produced but *two worms*, and these both died. The other eggs shrivelled up as if they had not been fecundated, and yet most of them preserved their lilac grey hue; there were among them, however, some which were minutely irrorated with black dots, while others again were faintly tinged with red.

A batch subsequently received from Mr. Cope produced an abundant family, the worms rather exceeding three inches in length when fully fed, and producing in May a lot of beautiful cocoons, some of which in point of size are but little inferior to cocoons of the Tussur received from Bhagulpore.

The first thing, then, to be attended to in preparing for the culture of silk, is the selection of a climate as much as possible approaching in its temperature and products to that of the original habitat of the insects, and this done, the next step to be observed will be the formation of a plantation of mulberry trees.

I say of *trees* particularly, because I hold the system of feeding from dwarf shrubs, as now generally practised in Bengal, to be the very worst that could have been selected, and to be one of the causes of the evil with which the worms are afflicted.

Under such a system the leaves are never permitted to ripen into a healthy state, or come to maturity, and are consequently weak and watery, for not only is nonage in itself an evil, but the constant cutting down of the shrubs is likewise most injurious, there being few trees which bear much pruning so ill as the mulberry, or which suffer more from its effects when not judiciously practised. Besides

which, as if to increase the evil as much as possible, these shrubs are generally planted in situations which are subject to inundations, a thing which is far from being desirable, as it only tends to render the juices of the tree still less adapted to the nourishment of the worm. On this subject M. Boitard remarks, "il semblerait que ce genre de culture ne devrait fournir que des feuilles mal élaborées et par conséquent nuisibles, et cependant l'experiénce prouve que les vers ainsi nourris donnent une soie superbe, très fine et trés forte." Yet that the leaves are in reality "mal élaborées et nuisibles," no one in his senses will pretend to deny, and, as previously observed, the very fineness of the silk is a convincing proof of the decay of the insect's constitution and power of secretion.

The mulberry tree, according to botanists, pertains to the family of *Urticaceæ*, or nettles, which is divided into several sections, but it will be sufficient for the purpose in hand to point out that in it are included the *Morus*, or mulberry tree, the *Artocarpus*, or bread fruit, and the *Ficus* or fig trees, for upon species belonging to these three genera wild silkworms of the genus *Bombyx* occur in different parts of India.

The mulberry tree now so extensively cultivated in different parts of Asia, and Europe, is said, like the worm which feeds upon it, to have been brought Westward originally from China, for although we read of wild mulberry trees in France and Italy, we are not to understand thereby *trees indigenous to the soil*, but simply such as have been produced from seed without being afterwards grafted. It is probable therefore that like the silkworms, the trees were originally exported from the northern parts of China, and it is certain that some species are sufficiently hardy to endure the rigours of a Russian winter, although in all probability a dry and temperate clime would be the best adapted to it. One thing, however, is tolerably certain, namely, that if the tree was originally from the north, as every

circumstance tends to prove, it cannot be expected to arrive at such perfection in the heats of Bengal, as in its native climate, and hence another link in the downward chain of circumstances which have tended to undermine the constitution of the worm. That the tree will grow to a goodly size, and become to all appearance vigorous and healthy, may no doubt be the case, but the question is, are the juices and properties of the leaves the same in hot, as in cold climates? And which leaf suits the insect best, that grown in Bengal, or that grown in its native region in China? It might be even worth while to institute inquiries on this head, and to appoint a competent person or persons to analyse the leaves of trees growing in different soils and climates, in order to ascertain whether the proportions of water, saccharine and resinous matter, fibre, &c. are the same in all, or in what climate and soil one component part exceeds another. Having ascertained this point, I should be tempted to select that soil and climate in which the components of the leaf the most nearly approximated to those grown in the northern districts of India, or, if possible, of China itself. That trees will grow in soils and situations which are not natural to them, and will appear healthy, vigorous, and even be productive of a luxuriant crop of leaves is nó doubt true, and Mr. Cope has lately instanced to this effect some trees growing on sandy islands in the Jhelum, and yet without an analysis of the leaf the fact is nothing to the purpose. Sandy soils being extremely porous, will require far more moisture to bind the soil about the roots, and give nourishment to the tree than stiffer soils, and the very lightness and porousness prevents the moisture from injuring the tree, *as such;* but what is *the quality of the leaf?* This is the point which affects the question; it is *not rank vegetation,* but nourishing leaves which we require.

Of the various kinds now under cultivation, the white-fruited species *(Morus alba)* is that which appears to be the

best adapted for the nourishment of the silkworm, and around Candahar in Afghanistan where they are beyond the influence of the wet monsoon, they grow to an immense size.

Much more attention in selecting soil and climate is necessary than appears ever to have been bestowed upon the subject, for how can it be expected that plants imported from Japan, or the Phillipine Islands will thrive as well in the mists and frosts of the Himalaya, as they do in their native countries, or how would the indigenous mulberry of our mountains bear the scorching heats of Bengal? Nor is it by any means certain that every species is suited to all the worms; each silkworm may probably, in its native haunts, be confined to one particular description of mulberry, and destined to thrive upon it alone. The Cashmere worms although they would eat the leaves of our indigenous wild mulberry, yet only did so on compulsion, as it were, and when very hungry; while then they never devoured one-half of the quantity given them, and on the introduction of the China leaf would instantly abandon the wild one and commence upon the other.

In the formation of a plantation, whether from cuttings, or from seed, care should be taken that the soil into which the young trees are subsequently transplanted, is richer than that in which they have been reared, for otherwise the plants, instead of thriving, will be thrown back and weakened. At Mussooree where, notwithstanding the elevation, the summer-heats are great, the cuttings planted in the early spring will require to be well watered until the monsoon sets in, by the middle of which, if the plants are strong and flourishing, they may be transplanted to open grounds, care being taken to injure the young roots as little as possible; and when the rainy season is over, these plants must be again watered until the leaves fall in the autumn, that is to say November; after which they may be left to the rains of heaven, unless, indeed, the soil should happen to be dry

and porous, in which case a spring watering will be required also.

Plants left in the nursery for a couple of years will have thrown out large roots, and these may be pulled up and transplanted without the least danger of their drying up, provided they are well watered until new shoots bud forth, —and when once rooted in the soil they will require little further care save to be protected from the ravages of cattle.

In France, where the worms are fed upon leaves gathered from large trees, the space between the stems is, according to M. Boitard, usually about thirty-six feet, but as trees of that size will not be required for *Bombyx Huttoni*, and would moreover be very inconvenient where the cocoons have to be gathered from the trees, I recommended that ground should be economised, and a space of sixteen feet only be left between the plants. This, after a foolish attempt to reduce the distance to *six feet* was sanctioned. In France, however, a tree is not considered of mature age for plucking until it is four years' old, and assuredly the Himalayan mulberry will not be ready sooner; it has nevertheless been decided that a trial of only three years shall be made, the same authority which endeavoured to limit the distance between them declaring that *in two years* the trees will be ready! Nous verrons.

The best soil for the cultivated species is said to be of a light, rich, and moderately dry nature, and if the substratum be not naturally pervious, it should be rendered so as much as possible, by giving a good bottom of brick rubbish, or other dry materials, and the surface soil should, at the same time, be kept open and not suffered to cake hard.

The trees which are indigenous to the Himalaya appear to care little in what soil they may chance to be located, some growing upon stiff dry clay, others in limestone gravel, and some again in the clefts of rocks where there is generally a light dry vegetable mould; in short, no situation,

seems to come amiss to them, and the young trees are usually to be found under the protecting shade of some large forest tree, from which the seed has been dropped in the dung of birds. The tree grows to a very large size, and the leaves are coarse, large, and leathery to the feel; sometimes ovate and serrated on the edges, and sometimes three-lobed even on the same tree; the fruit is small and pale red. They usually come into leaf about the first week in March, although this of course is regulated by situation and the season. *There are two crops* of leaves during the season, the second springing forth ready for the second brood of *Bombyx Huttoni,* and usually remaining on the tree until November.

So much for the theoretic dreams of those who declare that annual worms are suited only to northern climates, because there is but one crop of mulberry leaves! When the first is not consumed on the tree, of course there is but one; but when these have been devoured by the worms, a new crop is again put forth! Thus we have two crops of leaves, the opening of which is adjusted to the hatchings of the two broods of the worm which is destined to feed upon them; thus showing clearly the never-failing Providential care of Nature's Lord for every department of His vast creation.

For the rearing of *Bombyx Huttoni,* I have selected cuttings chiefly from the wild and indigenous trees upon which, in 1837, I first discovered it at Simla; and this I have done partly because, as I have already said, I have thought it wise to adhere as closely as possible to Nature's teaching; and partly because I have an idea that the worm really thrives better upon it than upon the cultivated kinds, many of which we should remember are, but artificial varieties of the Chinese stock. Besides which, these latter generally come into leaf at least ten days, or a fortnight, before the wild tree, so that by the time the young worm is disclosed from the egg, the leaves have attained a hardness which is not favorable to

the young brood. The buds of the wild tree opening out at the very time when the worm is hatched, affords a significant hint to the observer that the one has been specially provided for the use of the other. Even in the more advanced stages, when the worm has gained size and strength, it never seems to take so kindly and earnestly to the cultivated tree as it does to the wild one, the leaves being apparently too thin and dry to suit its palate.

In such a climate probably as that of Bengal, not only the young plants, but even trees, may require an occasional watering on account of the porous nature of the soil and the scorching heat of the sun, and such too would be very necessary in the Deyrah-Doon; but as a general rule those soils and hollow situations where water is apt to lodge should be carefully avoided, as well as the banks of streams, rivers, marshes and tanks, unless the soil be very pervious and the climate at the same time hot; because there the leaves are apt to become spotted and unhealthy; and even though no outward signs of sickness be exhibited, the juices of the tree and leaf can never be so nourishing as when grown in more congenial situations. This at least is the opinion of practical men in Europe, and "experience has proved that silkworms nourished by leaves gathered from *a dry soil* succeed much better, produce more cocoons, and are less subject to those diseases which destroy them, than those which have been nourished by leaves produced by an extremely rich soil."—*Journal d'Agriculture des Pays Bas.*

If a soil is good, even though it be of little depth, it will often be preferable to one that is deeper, as instead of throwing down its roots as it probably might do in a deep soil, the tree will direct them laterally and horizontally at no great depth beneath the surface, and thus profiting from atmospheric influences the leaf produced will be of far better quality.

Elevated lands, sheltered from the northern blasts are the best adapted to the tree, whose branches are two tender to

resist strong gales; this, however, applies rather to the cultivated species than to the Himalayan trees, and proves, I think, that while our mountain mulberry possesses a strength of wood calculated to resist the sudden blasts which occasionally sweep over them, those of China indicate, in their inability to stand a gale, that they are either the natives of sheltered glens or of regions where storms of wind are not experienced. It needs therefore, only the exercise of a little common sense in choosing a situation for the plantation, and it surely does not require one to be a very great naturalist to enable him to perceive and to appreciate such plain and obvious facts as these.

At the same time care should be taken that the trees are not too much sheltered and confined, but on the contrary that they are well aired, and light freely admitted, even while protected from too strong a gale, as exposure to moderate winds is found to render the tree more hardy, and imparts a greater degree of hardness to the wood. The leaves of trees planted in shady places where the sun is not freely admitted, become watery, and of bad quality, the direct action of sunlight upon the leaves being absolutely necessary, in order to convert the carbonic acid gas imbibed through the roots into carbon, for the nourishment of the tree. Nothing, in fact, is better calculated to show the importance of the leaves in nourishing the tree, than the fact that frequent and over denudation will cause the tree suddenly to die; this is what the French term "*l'asphyxie,*" which is said to occur when "l'arbre, privé de ses organes respiratoires," that is the leaves, "n'a pas assez de vigueur pour en reproduire d'autres assez promptement." Rozier tells us that "cette operation arrête presque tout à coup la respiration de l'arbre par less feuillees." It is recorded also that in 1600, M. Olivier de Serres planted a great number of mulberry trees at Villeneuve-le-Berg, and from which no leaves were plucked until the trees had attained to 20 years of age; the

consequence was that many of them were still alive in 1828, while it is seldom that a tree treated in the ordinary way of plucking at four or five years old can be induced to linger on for more than 30 to 40 years. Hence it is easy to see the effect which must be produced upon the worms, since the juices of the tree become impaired from the moment the plucking of the leaves commences.

Now since it is a well known fact, that it is by the action of the sun upon the leaves that the carbonic acid gas which they contain is converted into carbon for the nourishment of the plant, it will readily be seen that the leaves play a very important part in the matter, and consequently that where a tree is systematically deprived of these organs, it must necessarily be weakened by the loss. Every leaf that is plucked from the tree becomes an additional "*nail in its coffin,*" as well as in that of the insect, so that year after year it becomes less and less adapted to afford a healthy nourishment.

But if the insect suffers from the injury thus inflicted upon the trees, not less does it suffer from the effects of the atmosphere by which, more specially in Bengal, it is daily and hourly surrounded. For no sooner are the leaves gathered from the trees than their vegetating, or vital functions, cease, as would be the case likewise in the amputation of a human limb; it is vain to deny it and to speak of the freshness of such food, for it is a positive fact that the putrefactive fermentation almost immediately begins, increasing more and more in the huts where the insects are fed, and surrounding them with an atmosphere of poisonous carbonic acid gas arising from the mass of vegetable matter and ordure upon which they are reposing.

That mephitic air, arising, in almost every instance, from the putrefactive fermentation of the leaves, and the multitudes of insects all exhaling a deleterious gas, is one of the chief causes of the maladies which, under different names

are recognised in Europe as affecting the silkworm, may convincingly be gathered from the accounts given by Kirby and Spence, as well as by various continental writers. Besides which, is it not a well known and acknowledged fact that when many human beings are crowded together in close ill-ventilated rooms, disease and even death are almost sure to ensue from the carbonic acid gas which they exhale? And what is it but the presence of this same gas that renders wet leaves so deadly a poison to the domesticated silkworm? In our mountain districts where wild silkworms are to be found upon trees, the leaves are often dripping with wet for days together, without in the least degree proving injurious to the worms which feed upon them. The reason is simply to be found in the fact that in a state of nature there are no deleterious gases arising from the leaves, whereas in the house the carbonic acid gas arising from the putrefactive fermentation of the vegetable mass is partially absorbed and held in solution by the water on the leaves, and this being swallowed by the worms becomes at once an active poison.

Hence, to conclude a lucubration which my readers have no doubt already pronounced too long, I would merely repeat what has already been said above, namely, that the sickness of the silkworm both in Europe and in Asia proceeds entirely from the highly artificial manner in which it lives, and that the only way to counteract the evil, and preserve the stock, is to occasionally reinvigorate the constitution of the worms by an influx of rude health, by crossing with the wild insects taken from their native trees.

MUSSOOREE:
*24th May*, 1859.

## *The Indigenous Plants of Bengal: By the* REV. J. LONG.

*(Concluded from page* 364, PART III, VOL. X.)

### CONCLUSION.

1. I have now completed the "Notes"; it would have been easy to have made them ten times the length, but the object has been not to write a *Flora Bengalensis,* but simply to give brief remarks on some of the leading indigenous plants. This little work, it is hoped, may be suggestive to Europeans residing in the Mofussil, who wish, amid the solitude of a country life, to have objects of interest around them when they walk out, and who desire to know something of the properties and structure of the indigenous plants in their neighbourhood, but may not have the opportunity of consulting the forty or fifty different works, scattered through which notices of those plants are to be found. Hence brevity in the description has been studied.

2. The following books have been consulted in compiling this work, and are recommended to those in search of further information :—

*Simmond's Commercial Products of the Vegetable Kingdom,* 1854; *Archer's Popular and Economic Botany; Sir W. Jones' Descriptive Catalogue of 78 Indian Plants; Hooker's and Thompson's Introductory Essay to the Flora Indica; Drury's Useful Plants of India; Transactions of the Agri-Horticultural Society of Bengal; Spry's Suggestions; Graham's Catalogue of Plants growing in Bombay and its Vicinity; Lindley's Vegetable Kingdom; Mason's Notes on the Flora of the Tenasserim Provinces and Burman Empire; Voigt's Calcutta Hortus Suburbinensis; Roxburgh's Flora Indica; Decandolle's Geographie Botanique; Ainslie's Materia Indica; Wise's Hindu Medicine; Wight's Illustrations of Indian Botany.*

Among native works that have been consulted, are the *Talif Sherif,* translated by Playfair, *the Ayur-Veda-Darpan,*

*Chikitsárnab, Chikitsá Ratnákar, Sárkaumadi, Drabyea-Guna,* besides a number of MSS. works of the Vaidea, or Doctor Caste. There is many a valuable remark lying buried in those books, the result of long observation, which, if translated into English, would be of great service. Dr. Wise in his "*History of Hindu medicine,*" and Royle in his "*Antiquity of Hindu medicine,*" have done much to bring the merits of native works on medical botany to public notice.

3. The writer of these notes can bear his testimony to the interest lent to many a solitary ramble in the jungles by having as a subject the observing the peculiarities of *indigenous* plants. Every month in the year gives some new phase to the vegetable world, so that constant variety is afforded. This study is a means also of realising more the power, wisdom, and goodness of God. We cease to have so much admiration for man's skill, or the curiosities of cities, when we see in the commonest weed a beauty of structure and adaptation which man cannot equal with all the scientific developments of the 19th century. This study is of value to the European in another point of view, it brings him more in contact with the common people, and tends to produce a kindlier tone towards them, as he finds that many, though having no book lore, yet are close and accurate observers of nature, and take a real interest in the objects of natural history. The writer has often been surprised at finding how matters considered known only to botanists were familiar to a common man, and he believes that no peasantry in the world excel the Bengali ones in powers of observation and "folk lore." It is to be regretted that they should be denied by the State, and by their own wealthy countrymen, the means of a sound elementary education, as many a Hugh Miller or Burnes may lie among them in embryo.

4. No one can peruse such works as "*Royle on the Fibrous Plants of India,*" or "*Drury's Useful Plants of India,*" without feeling what treasures, hereafter to add to the resources

of this country, may lie hid in the indigenous plants of Bengal, but they need being tested by a scientific hand. Though natives apply them to many purposes that Europeans little think of, yet their use in arts and manufactures have still to be developed by the European mind. Of how little value was the indigo in India for ages, though fifteen centuries ago it had the Sanskrit name of *banikbandu*—the merchant's friend; and so with respect to a large class of fibrous plants. The natives use for TANNING the bark of the *bábul* and *gharan*, the rind of the *dálim* fruit, the juice of the wood of *khuerá*, the seeds of the *supari* and *haritaki*. In DYEING they employ the roots of the *ach*, *haldi*; the wood of *bukam*: and the bark of *jam*, *piyárá*; the leaves of *sim*, *aparajita*, *nil*; the flowers of *kusum*, *jabá*, *sipháliká*: the fruit of *pui*, *latkan*, *pánsioli*; GUMS are obtained from the stems of *káshmiri*, *bat*, *ashvath*, *chhátim*, *sayambar*, *amrá*, *jjuli*, *háparmáli*, *úkanda*: SOAP is made from the *nárikel*, *sarshap*.

5. This work, when translated with adaptations into Bengali, it is hoped may be of use in schools. One of the greatest wants in Bengal at present is trained *malis*, men who know not only *what* to do, but *why* to do it, who having some knowledge of the structure and classification of plants, can deal with a new plant in a scientific and not merely empiric method. The Agri-Horticultural Society have recognised the principle by the money they gave to the formation of a school for training young *malis*, though it has not yet succeeded, owing to the apathy of zemindars, and the difficulty in getting a suitable class of boys. We trust the day is not distant when, as in France and Germany, the elements of agricultural science shall form a subject of study in all schools in rural districts in Bengal, and when a work on the plan of these "Notes" shall form one of the class books. The substance of these "Notes" was delivered in a course of lectures in Bengali to pupils of a village school at Thakurpukur, and, though none of them

understood English, yet it was surprising with what ease they acquired the principles of the *natural* system of botany. It is certainly more natural to the common people than the Linnæan, which judges of plants by the same narrow view as if the various races of mankind were to be classified according to the size and length of their noses.

6. The author published several years ago an Introduction to Botany in Bengali, of which 2,500 copies have been sold : in it he has used instead of difficult and hard Latin and Greek names, terms derived from the Sanskrit and used in Bengali, and he has been delighted in seeing how easy the study became when indigenous terms were used that defined themselves. On the other hand, he began to teach a class of natives botany through English, and he had to give it up in sheer dispair, such difficulties were interposed by the scientific nomenclature. He therefore fully sympathises with the following views of Professor Lindley : "No one who has had experience in the progress of botany as a science, can doubt that it has been more impeded in this country by the *repulsive* appearance of the *names* it employs than by any other cause whatever ; and that in fact this circumstance has proved an invariable obstacle to its becoming the serious occupation of those who are unacquainted with the learned languages." A Latin and Greek nomenclature is necessary for scientific students, but it is a complete barrier to *popular* study, and especially in India, where little attention is paid to Latin and Greek. I give here a specimen of the way Latin and Greek botanical terms have been rendered by me into the Bengali language :—

| | | | |
|---|---|---|---|
| *Botany* | Plant knowledge. | *Hastate* | Spear-shaped. |
| *Bract* | Flower-cup leaf. | *Ovate* | Egg-shaped. |
| *Calyx* | Flower-cup. | *Pericarp* | Seed-bag. |
| *Campanulate* | Bell-shaped. | *Parasite* | Son of a tree. |
| *Crenulate* | Notched. | *Petiole* | Leaf-stalk. |
| *Endogen* | Inward grower. | *Pinnate* | Feather-shaped. |
| *Exogen* | Outward grower. | *Peduncle* | Flower-stalk. |

*Subulate* Awl-shaped.

7. The vernacular names of plants are constructed on the principle applied generally to oriental names, viz., denoting by the name some leading property or peculiarity of the object. The Bengali peasants have great power of observation, and the epithets they apply to plants shew they understand the principle of "eyes and no eyes." To the European, the knowledge of these names is valuable, not only as leading to things, but also for serving as a *memoria technica,* to enable one to recollect names.

8. Nor have the English peasantry been inattentive to this principle of significant vernacular names, though of late years an immense number of Latin *sesquipedalia verba* have been introduced. The following list of English names of plants shews that the common people in England as well as in India, like an expressive epithet which defines itself: *Adam's Needle; Bachelor's Button; Bead-Tree; Bind-Weed; Bladder-Nut; Buck-Thorn; Butter-Cup; Devil's-Bit; Dog's-bane; Duck's-meat; Goat's Beard; Goose-grass; Hedge-Hog Thistle; Honey-suckle; Lady's-Bower; Lady's-Finger; Lady's-Slipper; Mad-Apple; Mouse-Ear; Old man's Beard; Passion Flower; Purging-Thorn; Snow-Drop; Worm-Wood.* Similar examples may be given from French, and above all from German, which has made all technical names *self-defining.** Many of the plant names in Europe are very expressive in their original language: thus *Coco; i. e.* the Cocoa-nut-tree, is a Portuguese name meaning to grin, because the 3 holes of the nut resemble a monkey grinning; *Olive* is Galic for oil, *i. e.*, the oil yielding plant; *Pomme de terre,* the French of apple, *i. e.*, "the apple of the earth." *Rubia,* the Latin for Madder, *i. e.*, "what dyes red;" *Geranium,* in Greek means Crane's bill, as the seeds are so shaped; *Lupinus, i. e.*, "what exhausts the land like a wolf;" *Currants, i. e.*, whose native place was Corinth.

*There is a German work, "*Handbuch der Botanische Terminologie,* 4to., pp. 581, which gives in German all the technical terms of botany. The Germans have always used indigenous terms in popular scientific works.

9. The following selection of the Bengali names of plants, with their meanings, illustrates the above remarks:—

*Amádá.*—Smell like a green *mango.*

*Ananta mul.*—Its *roots spread* very widely; another of the genus is called the *shat mul* or hundred mouthed.

*Bágh ángkrá.*—Its tendrils grasp like a *tiger's paw.*

*Bágh nakhi shim.*—The beans shaped like a *tiger's claws.*

*Báj bárán or trisírá.*—People place it on the roof to *prevent lightning* or a thunderbolt falling, it is the native lightning conductor.

*Bháng chháttá.*—The *frog's umbrella,* English *toadstool.*

*Bish tárak.*—Its leaves used for poultices in *poisons.*

*Bhui dumur.*—*Ficus repens.* A fig tree which *trails on the ground.* The common fig rises a pretty fair height in contrast with this one which cleaves to the earth.

*Chámuri.*—Flower is shaped like a *horse's fan.*

*Chupri álu.*—Potatoes large as a *basket.*

*Chhágal bánti.*—Its fruit is like a *goat's nipples.*

*Deri latá.*—Its flower shaped as an *(dheri)* ear-ornament.

*Dháni lángká.*—The fruit *chili,* short as rice grain.

*Ganda bená.*—The *scented grass.*

*Ganda ráj.*—*King of scents:* being very fragrant.

*Gol álu.*—The *round vegetable;* the French call the potato "the earth-apple."

*Ghrita Kumári,*—*i. e.* the plant which leads a *short life* as a *virgin,* and whose juice is like *ghee.*

*Hár bhángá.*—Its juice said to unite *broken bones;* another name is *hárjjorá,* "the bone-uniter".

*Háti surá.*—Its flower shaped like an *elephant's trunk.*

*Him ságar.*—Its leaves are an *ocean of ice* to the touch; another plant the *Dol Samudra* is so called from its waving, hence its name "an ocean of waving".

*Indur Kána pana.*—Leaves shaped as *rat's ears.*

*Jagyadumur.*—Used in the *agnihom* or fire-sacrifice at marriages, which *couple* together.

*Jjumka lata.*—Its flower shaped as an *earring.*

*Kanak champá.*—Flower like *gold* in color; there is another *champa,* the *blue,* whose flower-stalks spring from the earth, and the *dulal,* or pleasing *champá, i. e.,* its flower is fragrant.

*Kukur jihba.*—Leaves shaped as a *dog's tongue.*

*Lajjábati*—or English sensitive plant, has *blushing* leaves.

*Mâtkarái.*—Peas grow in the earth, sold in Calcutta as the *China badám,* or Chinese almond, but it is a different plant.

*Murog phul.*—Its flower like a *Cock's-crest.* Similarly the English cockscomb.

*Nág keshar.*—Its flowers are like a *snake's hood.*

*Nimuki.*—Its leaves *without a point.* The leaf-stalk springs from the centre of the leaf.

*Ol kopi.*—A cabbage whose stem is like *the ol.*

*Páni marich.*—An *aquatic,* pungent as *pepper,* having its fruit from the water.

*Páni phal.*—Its nut, which is called *singáhár, i. e.,* shaped with projections like a cow's horn, purifies the water.

*Phani manasá.*—The manasa with a *snake's hood.* Lac is made from the insect which feeds on it.

*Phul kopi.*—The *cabbage flower.* The English name is similar to *cauliflower, i. e.,* stalk-flower.

*Rajani gandha.*—The *night-scenter.* It opens its flowers at night, and diffuses a beautiful scent.

*Shákar kanda alu.*—Its fibres shaped as the *ság.*

*Shank álu.*—Its root shaped as a *sea-shell.*

*Shul pani.*—Leaves shaped as a *spear.*

*Solá kachu.*—An arum, light, *spongy as the solá.*

*Sapta parni.*—Has *seven leaves.*

It is to be regretted that Europeans, instead of teaching *malis* to murder Latin names, do not themselves learn the native names, which they would find very valuable as a key to the nature of the plant, in various cases serving also as a means of more easily remembering it.

10. Proverbs also show, as well as names, how natives observe. The Bengali language is rich in proverbs, which, like all proverbs, are "the great universal voice of humanity, the edge-tools of speech which cut the knots of business." We give some of these relating to the plant world, which have never appeared in print before;—they are the language of nature.

"*We see you as seldom as the* DUMUR *flower.*" (*Tumi dumarer phul.*)—Applied to a person rarely seen, as the *dumur* seldom flowers.

"*By the* ISHWARMUL *the serpent is silenced.*" (*Ishwar mule sáp jjabda.*)—The smell of the *ishwarmul* is used to stupify snakes, who therefore dread it as the thieves do the magistrate.

"*He throws pearls among* BENA *groves.*" (*Bena bane muktá charána.*)—Like "casting pearls before swine."—The pearl is of no use in a jungle—

> "Full many a flower is born to blush unseen,
> And waste its sweetness on the desert air."

"*The Rajas are fighting, the* ULU GRASS *and reeds are destroyed,*" (*Rájá rájái judha hai, ulu kánkhrár prán jái.*)—Like "Reges delirant plectuntur Achivi," subjects suffer for the quarrels of their rulers.

"*Hanging a man for stealing* POT-HERBS." (*Shák chorke shul.*)—A severe punishment for a small offence.

"*The storm strikes the* HIGH TREE." *Bara gáchhea, bara jjhar.*)—Great men are peculiarly exposed to calamity.

"*The* PALM TREE *increases by bearing its bushy head uncut; the* WILD DATE *increases by cutting it yearly.*" (*Tál báre jhope, khejur báre kope*)—You must not have the same rule for all.—"One man's meat is another man's poison."

"*If the* KASHA *flowers, the rains are ending.*" (*Phutile kashe phuráila barsha.*)—The Káshá, or shining, is a beautiful

cottony grass, which is in full blossom at the close of the rains. It is equivalent to "look to the signs of the times."

"*It is the fine* MA'KHA'L *outside, but its inside is bitter.*" (*Mákhálphaler, bhitare kála.*)—Applied to a handsome fool.

"*Like the* CUCUMBER'S *holes, not on the outside.*" (*Shashár phák.*)—Fair without, foul within.

"*He can place many on the* TOP OF THE TREE." (*Gáchhe utáite aneke páre.*)—Like leaving one in the lurch. Leading them into a difficulty, but not getting them out of it.

"*The stroke of the sword is as the* SIZE OF THE TREE." (*Jhope bhuje kop.*)—You must proportion the exertion to the object to be attained.

"*Things will come round, as the* WINTER RICE *after the ausor or rainy rice.*" (*Jakhan kár jeman, aus phuráile eman.*)—"Sorrow may endure for a night, but joy cometh in the morning."

"*Poor fellow he is as an* AMRA *tree in winter, only seed and bark.*" (*Haire ámrá, kebal ánti O chámrá.*)—Applying for money to a rich man who has fallen into poverty, and is therefore in a wintery state of his circumstances.

"*When the* RICE *is ripe he gives a harrow.*" (*Páka dhánc mai deoyá.*)—A thing done out of season, like "locking the stable when the horse is gone."

"*He eats only the root of the* SHALUK, *his teeth are black, yet people say he is well.*" (*Sháluk kheye, dánt kála, loke bale áchhe bhála.*)—Respectable natives blacken their teeth for ornament, a mark of a respectable condition: the poor man's are blackened from eating the shaluk herb, and he has therefore the appearance of well to do.

"*The* RADISH *pulled up grows not again, not so the* BEGUN." (*Mulá báre nai, begun báre.*)—The miser gives once, as the radish's root grows only once; the generous gives often, as the begun, if pulled up, grows again.

"*The* OL *says to the* MA'NKACHU '*why are you bitter.*" (*Ol bale mánkachu bhái, tumi kena lága.*)—The roots of the *ol* are acrid when raw, and exhale when flowering a great stench, so that flies supposing it to be carrion cover the flower branch with their eggs, the *mán kachu* root is also acrid, as they both belong to the same family, whose roots are acrid. Equivalent to the English proverb "the kettle calling the pot black."

"*He mounts not the tree, yet expects a bunch of fruit.*" (*Gáchhe ná utite ek khándi.*)—You must use the means.

"*The* JACK FRUIT *hangs on the tree, yet he applies oil to his whiskers.*" (*Gáchhe kántál, gope tel.*)—Doing a thing before the time; the oil is put on the whisker when the jack is on the table; similarly the Hindus say "he fastens the door where there is no house."

"*The finger swells equal to a* PLANTAIN *tree.*" (*Ángul phulle kalágáchh.*)—An improbable story, the plantain's stem being very thick.

"*The crow eats the* JACK FRUIT, *but its juice is on the bak's mouth.*" (*Káke Khái Kántál, baker mukhe átá.*)—Attributing your own fault to an innocent person: the bak bird lives in the water, and does not touch the fruit.

"*As is the* WILD OL *such is the ripe* TAMARIND." (*Jeman buna ol, temani páká tetul.*)—The tamarind juice counteracts the effect of the wild ol: for every sin there is punishment, for every poison a remedy.

"*When the* BEL *fruit is ripe, what can the crow do.*" (*Bel pákile, Káker ki.*)—When the bel fruit is ripe, the crow cannot break the hard shell:—applied to a work which cannot be done after a given time.

"*A pole to reach the* BEGUN *fruit.*" (*Begun gáchhe ánkurshi.*)—Equivalent to the English, "a steam-engine to cut cabbages."

"*A* BAMBU *dies by flowering once, a man by wandering about.*" (*Báns mare phulle, Mánush mare bhule.*)—This singular fact about the bambu is applied like the English, "a rolling stone gets no moss."

"*A race like the* UCHHEA *plant, all bitter.*" (*Jhár, jhár, uchhear jjhár.*)—The uchhea's leaves and fruits are all bitter, —applied to a family all whose members are bad.

"*The branch of the* BAMBU *is sometimes harder than the bambu itself.*" (*Bánsher chheye kunchi shakta.*)—Applied where a son is superior to his father.

"*As the* SHYEAKAL *thorns.*" (*Shyeákuler kántá.*)—These thorns are so curved, it is not easy to disentangle clothes from them,—applied to an enemy difficult to get rid of.

"*One whose head is shaved, does not go a second time under the* BEL *tree.*" (*Nerá kai bár bel talai jái.*)—The bel fruit falls heavily on a bare head,—corresponds to the English "a burnt child dreads the fire."

11. The Sanskrit names of plants have been often given in these "Notes" and are of importance in ascertaining whether a plant is indigenous or no. Monsieur Decandole, who in his *Geographie Botanique* has written so fully on the tests for indigenous plants, lays down the principle that a Sanskrit name for a plant is a sure indication that it is Indian. He writes thus, "The Sanskrit is of immense value in ascertaining whether or no plants in India are indigenous. It was a dead language when Alexander invaded India. *Every plant indigenous to North India ought to have a Sanskrit name,* if it is of a nature to strike the common people, or presents any peculiar property. The Sanskrit, though a dead language, yet has remains of great works and local traditions." The *Amera Kosh,* edited by Colebrooke, is very valuable as a reference for the Sanskrit names of plants. Ainslie, Royle, and others who have written on Indian plants, have

recognized the value of the Sanskrit names in connection with Botany.*

12. Nor have the charms of Sanskrit poetry been withheld from indigenuous plants. Kalidas, the Indian Wordsworth, in his poem on the seasons and in his dramas, is enthusiastic on the beauties of the vegetable kingdom. The Ramayan, composed 2500 years ago, has many beautiful passages descriptive of rural scenery, and of the indigenous plants in the neighbourhood of hermitages. Sanskrit poetry may be pre-eminently called the poetry of nature: we see it in the songs of the Vedas, chaunted by the Aryan Brahmans on the banks of the Indus, in the strains of Valmiki and Vyeas, in all their dramatic literature, and even in their poetry on metaphysical subjects.

Indigenous plants are a source of constant illustrations in Sanskrit poetry, thus the *mango* "the harbinger and soul of spring," "eyes restless as the *water-lily*," "heart trembling as a plantain leaf,"—"fate sporting with men as a drop of water trembling on a *lotus leaf*,"—"joy after terror as a *lotus* opening its leaves after the night"—"women like *flowers* are of tender fabric, and should be handled gently,"—"an intellect sharp as *kusa* grass,"—"death kills by gentle means as the *lily* by melted snow,"—"a good woman surrounded by evil company as the chaste *mimosa* by poisonous herbs."

13. The list of indigenous plants given in these Notes embraces only those grown in the delta of Bengal, *i. e.*, from Rajmahal, the apex of the delta, to Midnapore and Dacca, its bases; they all grow in soil of alluvial formation.

It does not include those of Assam to the East, nor of the Midnapore, Orissa, and Bancoorah hills to the West, nor of the Rajmahal hills to the North, nor of the Sunderbunds. Assam

* The writer was puzzled by the fact that the *Tamarind tree,* which has various Sanskrit names is yet admitted by botanists not to be a native of India. At length he ascertained it was a native of Java, when the whole question was cleared up,—the Brahmans were once colonists in Java.

for instance abounds with orchids, and in Robinson's Assam various particulars of its vegetation are to be found.

The oldest naturalized plant in this country is the *tetul* or tamarind, introduced before the Christian era from Java to India, then the *rose* from Persia brought in probably with the Patans. Peru has furnished the *suryeamukhi*; South America the *phani manasá*; China the *gandharaj* and *lichi*. Few natives will believe that the *pepiyá* is not indigenous, yet there is no doubt that, like the potato, it is of South American origin, and is one of the few remembrances the Portuguese have left behind them. The *shyeál kánta* is remarkable for the extent to which it has spread over Bengal, the writer has seen it near Sasseram, yet it was introduced from Mexico two centuries ago. We have an illustrative case in the *Briophyllum calycinum*, which was introduced by Lady Clive toward the close of last century, but is now found every where in Bengal.

14. The MARRIAGE OF CERTAIN PLANTS is a curious custom among the Hindus, the *ashvatha* is regarded as the male, and the *bat* the female, and it is accounted an act of merit according to the Puranas to wed them, and travellers enjoy rest under their shade. A priest performs the ceremony, the expenses connected with which amount to about 40 rupees. It takes place in April generally. Some females plant the *bat* and *ashvath*, and water them with their own hands for several years.

Connected with this is the WORSHIP OF VARIOUS TREES; the *ashvath* is sacred to Vishnu, the *bel* to Durgá, the *bat* to Sita, the *manasá* to the goddess of snakes. The *ashvath* or *pippul* is regarded as a very holy tree by the Hindus; the Brahmans say Vishnu sat on its leaves, while the common people view the tremulous motion of its leaves as caused by a *bhut*, or ghost, sitting under each and setting them in motion. It is every where, under the name of the *bo* tree, held in the greatest esteem by the Buddhists,

who regard its quivering leaves as a symbol of the unceasing motion of life, the perpetual motion, hence Buddha's thoughts are said to have been directed by it to the eternal and unchangeable. The leaves of the oak seem to have suggested the same ideas to the ancient Druids of England.*

The *bat* is the favorite in Hindu worship. The labyrinth of stems, which prevents the form or beginning of the tree from being distinguished, was used in ancient Indian philosophy, to symbolize the difficulty of searching out a foundation of *wisdom*, while the numerous aerial roots sent down represented the bonds in which earthly passions hold the soul; its never ceasing extension and renewal, the eternally revolving course of nature. See the *Bhagavat gita* on the *bat*.

The *asoka* tree is worshipped by Hindu women on April 15th; they and their children on that day, to secure themselves from snakes, eat, each one, seven of its flowers.

The *ka'sanda*, a famous Indian pickle, is worshipped by Hindu women, who proceed to the river with all the ingredients, and there worship them; in order to have the gods present, the priest blows the sacred shell.

The *manasá* tree is also worshipped by Hindu females to preserve them from snakes. On the 15th September, they fling into the river a branch of the *manasá*, which had been planted near their own houses. Near a large *manasá* tree the people assemble, while the snake-catchers of the neighbourhood bring their snakes to the place to make them dance.

The *champa* tree is connected with a curious ceremony, *Vaisaki champá*. A woman wishes to secure herself against widowhood, by placing every day in succession for a month, a Brahman on a couch, feeding him well, fanning him

* The Greeks had the idea that Jupiter resided in the oak, and they considered the flickering of the leaves an intimation that he heard their prayers.

to sleep, and placing a necklace of *champa* flowers round his neck; there is a fresh Brahman every day, and, at the end of the month, the ceremony is concluded by giving the family priest apparel and a golden *champa* flower. It would be easy to enlarge on this subject, by giving an account of the worship connected with the *tulsi*, *bilva*, *durbá*, *kásia*, *nárikel*, and of the use made by Hindus of the flowers of the *ákanda*, *atasi*, *bak*, *bakul*, *bela*, *dhutura*, *gandá*, *javá*, *kadamba*, *kámini*, *&c.*, and to give extracts from Indian poets on native plants; but we trust enough has been written to show that whether for business, amusement, or health, the study of indigenous plants is richly deserving the attention of Europeans. Railways will lead Europeans away from cities, and it will be interesting to have solitude sweetened by a familiarity with the plant world, which affords such companionship, that a man in the jungles can say, "he is never less alone than when alone."

The medical value of indigenous plants is a subject . great importance as shewn in the writings of O'Shaughnessy, Wise, Playfair, and Ainslie, but the limits we have assigned to this article will not allow our entering now on this deeply interesting subject.

## *Index.*

---

*On the introduction of Flax, as a fibre-yielding plant, into India, and especially into the Punjab* :—*By* HENRY COPE, ESQ.

It was, at one time, (that "good old time" which some of us still persist in regretting,) received as an axiom in Agriculture, that certain plants could only be successfully cultivated under given circumstances, and as an integral portion

of this axiom, that *Flax*, and its oil-producing seed, yielding at this day, next to the more important cereals, and one or two other exceptions, the most saleable article of general commerce, could only be grown, with advantage to the agriculturist, in temperate latitudes. The first inroad, in modern times, on this "pre-conceived notion,"—for it is, like many other assumed facts in the region of Natural History, nothing else than a preconceived notion (without any real foundation in fact,) fostered by the interests and prejudices of grim Russia merchants and obstinate Hollanders,—was, if I mistake not, made in Egypt. I say "in modern times," for it is generally understood that, if not absolutely the original habitat of flax, Egypt certainly was its cradle, and, acting on the traditions of old Mahomed Alee, the wise, the cruel, and the rapacious, who has not been inaptly represented, in this country, by Maharajah Goolab Sing of Jumoo, halted not, heeded not, until he had made a staple produce of flax, and flax of a merchantable character. It takes its stand, in the markets of Europe, though somewhat lower in quality, beside the flax of Riga and of Belgium, though reared ten, fifteen, and twenty degrees farther south than was previously considered possible. The quality of the Egyptian soil makes up for the difference in latitude. It is this great fact of suitable soil, with another that will be mentioned hereafter, that underlies the question of flax cultivation in India, and especially in the Punjab. It is true that it is at present an empirical fact, deducible only from experiments, but I entertain no doubt that, when the soils, which are now considered suitable to flax cultivation in the Punjab and other parts of India, are submitted, as they ought long since to have been, to careful analysis, they will be found to contain those peculiar elements of nourishment that are required for the due development of fibre in the flax plant.

Moreover, the difference of climate is fully balanced by the reversal of seasons; plants that are grown, in the colder latitudes of Europe, during the summer months, being cultivable,

with advantage, in more southern and eastern regions, during the so-called winter months. Everything else, except the ignorance of the people, which is, without doubt, the grand obstacle to be overcome, is in favour of successful flax-growing in many parts of India, and especially in its higher latitudes; and it is, therefore, remarkable, that it is only, within a very few years, that any general attention has been devoted to the introduction of flax, as a fibre-yielding plant, in the territories occupied by the East India Company. Land in England is burthened with rent and taxes to the average amount of fifteen rupees per acre; wheat, of much easier cultivation, is sold at from six to eight times its average value in India; labor is infinitely dearer in England than in India. There is nothing, I repeat, but the old hard leaven of conservatism in the people, *and ourselves*, to be overcome to make flax a productive staple in this country. It was, certainly, a problem, hitherto, whether the flax produced in India would really be suitable to the English market. It has been solved in the most satisfactory manner; the produce, of the Punjab at least, has been pronounced of such a useful quality, as to induce the men of Belfast to declare their readiness to purchase any reasonable quantity, at a remunerative rate, while the men of Dundee loudly proclaim that they are prepared to consume *ten thousand* TONS, if they can be supplied, and that they also will give a paying price. With such a declaration, which it would be satisfactory to find backed by active measures, to aid in securing the supply the good people of Dundee require, I trust the Agri-Horticultural Society of India will not consider it beyond its province to permit me shortly to pass in review, *first*, what has been done *in India* towards the cultivation of flax, *secondly*, the results of the recent movement *in the Punjab*; and, *thirdly*, what may be done in other parts of India, and also in the Punjab with the view to the further extension of the plant in the mode likely to be most acceptable to the people.

Dr. Roxburgh was in this, as in many other instances, the first pioneer. He directed his attention to flax upwards of fifty years ago, but he had too much on his hands to be able to devote to the subject the time it required. It slept, almost unnoticed, for some forty years, when Mr. Rogers, of the firm of Hamilton and Co., in Calcutta, revived it with much energy, formed a Flax Company in England called the "London Experimental Flax Company," and did all in his power to bring the capabilities of Bengal, as regards flax, into notice. The Agri-Horticultural Society of India aided in the movement; a practical Belgian flax-grower was sent out, whose opinion of the trials, in several parts of Bengal and Behar, was favorable, the Liverpool valuations of flax, actually grown and manufactured, were highly encouraging, an experimental farm was established at Bulleea near Ghazeepoor, and yet nothing came of it. In no one instance, of all those adduced by a special Committee, appointed by the Society, did it appear that any doubt existed "on the minds of the parties concerned of the excellence of the soil and climate of Bengal, and of the Doab, for the production of flax, and every analogy went to strengthen the belief, that the North-Western Provinces, generally, where the plant is everywhere extensively grown for its seed, is equally eligible for the growth of the plant for its fibre." The Government asked the Society for information, the Society collected and gave it, but on their recommending that a money premium be offered for a certain term of years, and the experiment be distinctly recognized as a Government undertaking, in which it should take a lively interest, the Government came to the Resolution that the cultivation of Flax could no longer be considered a doubtful experiment, since it appeared from the Society's report to have proved, in many instances, successful, and where successful to be very profitable. The Governor-General in Council, (Lord Auckland) was, therefore, much inclined to doubt whether any bounty or reward from Government was

necessary, or would be justifiable, for the support of the undertaking. The cold water thus, and as it appears most unexpectedly, thrown on the zeal of the Society effectually damped its ardour on behalf of flax cultivation in Bengal, and we heard next to nothing more on the subject. That degree of perseverance so necessary to overcome the *vis inertiæ* exercising so baneful an influence on all matters of this kind in India, was probably wanting somewhere. It is difficult to trace the cause of the failure of the movement, whether the Society had over-estimated the prospect of success; or whether the lukewarmness of Government was, as I believe, the immediate ground, but fail it did, and very little more was done in India about flax, if we except some few sporadic attempts on a small scale at Monghyr, Mirzapore, Jubbulpoor, Allyghur and Saharunpore, till the subject was taken up in the Punjab, in 1853, by the local Agri-Horticultural Society, at my suggestion.

Having, for some time, carefully considered the question, I came to the conclusion, founded on all that had been attempted in Bengal, with the advantage of a better climate, that flax might be grown with advantage in that Province, and this conclusion has been amply justified by the event. I obtained a small quantity of acclimated flax-seed from Dr. Jameson of Saharunpore. The crop, a garden one, was singularly successful; the produce, prepared by an Irish flaxscutcher, pronounced really good, both in England and in Calcutta; and the result, altogether so encouraging, that I was called upon to draw up a scheme for extended cultivation. I did so. The plan was submitted to the Agri-Horticultural Society of the Punjab, approved of, commended by the Members of that institution to the attention of the local Government, warmly taken up by the Supreme authorities, Lord Dalhousie taking a personal interest in the question, and carried out the following season, if not with all the success that was anticipated, at least

not only without loss to Government, but with a considerable profit.

I will briefly analyze the proposal, and its working, from my official report, published by the Supreme Government, in their "Selections from State Papers," premising that it had been previously ascertained, from a mass of information collected under the orders of the Chief-Commissioner of the Punjab, that linseed had been sparingly cultivated in many of the Northern parts of that province, the oil being used as medicine for cattle and the cake for their food; and that, in some few localities, the fibre of the plant had been employed for the very rude purpose of being twisted into twine for bedsteads, the fibre being trodden under foot by cattle after the stem had been stripped of the seed and dried, and by this rude process, converted into tow, locally called "Foolee." One great and important fact, was elicited, in the course of these enquiries, *viz.*, that the growth of the flax plant, in the higher latitudes of the Punjab, was much slower than in the almost tropical climate of Bengal, a fact that will, of itself, readily account, with that of suitable soil, for the success of flax-growing in the former, and its almost entire failure in the latter province, if we are to receive the abandonment of all further experiments as a sign of failure; for it is absolutely necessary, to the due elaboration of fibre of a merchantable quality, that this plant should not attain maturity with the rapidity invariably consequent on a damp hot climate, such as that of Bengal.

The propositions, approved of by a special Committee and favorably submitted to the Supreme Government by the Chief Commissioner, on the recommendation of the Agri-Horticultural Society of the Punjab, were to the following effect:—

1*st.*—That three premia, of Rs. 500, 350, and 200, should be awarded for the successful cultivation of flax on areas to be, respectively, not less than 25, 20, and 15 acres,

either by individual zemindars or by village communities in common.

*2nd.*—That the entire crop of merchantable flax, including seed, and fibre of the required length, that might be produced in the Punjab, should be purchased by the Government, to be paid for at the market rate of the seed, with 25 per cent. added for the fibre.

*3rd.*—Simple directions for the cultivation of the plant, so as to induce something like the required length of stem, were to be furnished by the Society, and extensively circulated.

*4th.*—The Society was authorized to cultivate forty beegahs of land, in the neighbourhood of its own garden, with the view of conducting a large operation under its own immediate superintendence; while it was determined—

*5th.*—To move the Court of Directors of the East India Company, who were known to take a lively interest in the extensive experiment, to send out a large supply of English, or rather Belgian and Russian seed, with the view of introducing a superior kind of produce, it being believed that the foreign would yield a better fibre than the indigenous seed, the plant, from which having been hitherto cultivated for its seed only, had been sown wide, and become a low branching plant, instead of producing the long straight branchless stem required to produce good fibre.

These propositions were passed in the year 1854.

The necessary operations, connected therewith, were entered on during the autumn of that year. As it appeared more than probable, that they would be considerable, and require much time and attention, I was authorized to obtain the services of an assistant, and was fortunate in securing those of Mr. Steiner, a German gentleman, who had recently arrived in India, and who was practically acquainted with the cultivation and preparation of flax. He was nominated Superintendent of Flax Operations, and was, in the first instance, deputed to inspect the large sowings of linseed, of

which reports came in from all parts of the country, especially in the districts of Goordaspoor, Seealkote, and Umritsur, and which had been readily undertaken, wherever seed was procurable, on the pledge of Government to purchase the whole of the produce, and pay for its carriage to market. It appeared, from those reports, that while, during the season 1853-54, only 3,453 acres of land were devoted to a sparing linseed cultivation in eight districts, from which comparative returns were obtained, more than 19,000 acres were devoted to the same in those eight districts during the season of 1854-55; while the whole cultivation for the Punjab, for that season, was found to cover 50,135 acres. In the district of Goordaspoor alone, the most favorable certainly, 12,136 acres were devoted to linseed, nearly 6,000 in Umballa, more than 5,000 in Umritsur, nearly 8,500, in Seealkote, the next best district, and upwards of 4,500 in Goojrat, almost equally suitable. The cultivation was taken up in several districts, where it had never before been attempted, and it was believed that, whereas the produce in linseed may, during the first-named season, have been about 28,000 maunds, value some Rupees 40,000, that of 1854-55 cannot have been less than 130,000 maunds, value Rupees 1,60,000, substituting, to that extent, an exportable staple for the almost always superabundant article of wheat.

The operations of the season 1854-55, which laid the foundation of such progress as has been since made, were so far successful as to have terminated in that most unusual of all results, in experiments of this kind, *a considerable profit to Government.* I will confine myself to a brief analysis of that part of the Report already alluded to, as being sometime since printed in *No. XV. of the Selections of the Records of the Government of India.*

The Report is divided into five Sections: The 1*st*, detailing the result of the cultivation by the Agri-Horticultural Society of the Punjab, on the forty beegahs of land in the

vicinity of their garden, sanctioned by the Supreme Government. *2ndly.*—The effect of the steps taken to increase *linseed* cultivation in the several districts of the Punjab.—*3rdly.*—The results of attempts to introduce the preparation of flax as an article of raw produce in that Province. *4thly.*—The view in which the offer of certain premia should be taken and modified; and, *lastly*, the further measures that appeared necessary to bring the whole of this most interesting experiment to a more successful issue, with remarks on the attention that might with advantage be devoted to other fibre-producing plants.

I.—The greater part of the land selected for the Society's own experiment was sown with country seed. A small portion with seed forwarded by Dr. Royle and received overland from England. Some of the land proved unsuitable (experience has always to be bought,) and the crop was scanty. Other portions were well adapted, and the promise of a favorable out-turn was considerable. The plants reared from English seed attained maturity before those raised from country stock were reaped, and yielded a very satisfactory out-turn, the stems being long, and the produce decidedly good. The native plant grows more slowly, but many of the fields looked most promising, when the fields were swept by a tremendous hail-storm, which scarcely left a whole flax-stem within the entire cultivated area. The only return was, consequently, a few maunds of seed.

II.—I have already mentioned above the extent to which *linseed* cultivation was increased, in the Punjab, under the effects of this experiment, during the season of 1854-55, the incentive of the market, offered by Government, acting, no doubt, as a powerful stimulus, on which the local influence of district officers was, moreover, brought to bear with considerable advantage. It was believed in theory (a theory founded on the received opinion, that the apathy of the grower of, would be very little below the apathy of the dealer in,

a new article of produce,) that the whole crop, or nearly so, would come into the hands of the authorities. Arrangements were accordingly made, in various parts of the country, for purchasing, storing, and transporting the expected produce; rates were fixed for the different districts, and the Government went so far as to make its prospects of a large mercantile transaction known to the commercial communities of Bengal, Bombay, and Kurachee.

"But, singular to say," (I quote the words of the Report under consideration,) "although the cultivators had expressed their readiness to sow, on the condition of the Government finding them a market, and notwithstanding the very large increase of produce, when the time came for reaping the crop, and cultivators were called on to bring in the produce, it was discovered that they could find a more profitable market than the one offered by Government, and that out of the whole 146,538 maunds, very reasonably supposed to have been produced, the quantity brought in for sale to the Government officers, [of more distant stations,] and to Lahore, only amounted to 11,301 maunds."

From this fact the Government might, with great advantage to all future experiments founded on sound data, have learnt that not only *will* the people cultivate new produce, when pressed to do so in a reasonable way, but that the mercantile community of the Punjab are not so very slow, as had been supposed, to adopt a new article of commerce. It is also said to be a fact, that the dealings originating with the linseed crop of 1855 materially paved the way for the successful trade in other oil seeds with Sukur and Kurachee, that commenced about that time, and has been carried on increasingly, with considerable advantage, both to the grower, the purchaser, and to the Government, who derive direct benefit by the increase of export duties at Kurachee and Bombay,—not to speak of the employment given to a large number of boatmen on the various rivers of the Province, to

the increase in river craft and the general stimulus afforded to the river trade.

The linseed produce of the districts of Kangra, Hoshearpoor, Jelum, Shahpoor, &c., was sent direct to Kurachee, and was there sold at a rate which yielded to Government an assumed gross profit of upwards of 10,000 Rupees, or some 59 per cent!

The seed collected at Lahore was sold on the spot at a profit of some 3,000 Rupees more. The experiment was, therefore, entirely successful, so far as linseed was concerned, but it is beyond a doubt, and I regret much to hear the fact to be well ascertained, that the impulse thus given to this particular cultivation was not sufficiently powerful to insure its extension, or even its continuation on a greatly enlarged scale. Another year or so of Government influence brought to bear on it, as I ventured to recommend, would have established linseed cultivation on a firm basis. That influence was prematurely withdrawn, and the quantity of seed produced in successive years, in the Punjab, has greatly diminished for the two material reasons, that the cultivation of til and mustard is less troublesome, (the Punjabee agriculturist is, with few exceptions, a sad idle dog,) and that some few Umritsur speculators, having (in their eagerness to buy up portions of the crop of 1855,) incurred losses on their purchase, have set their faces against the staple, and thereby influenced zemindars by their opinions to discontinue their more extensive sowings.

III.—I come, in the third place, to the most interesting, as well as most important, part of the experiment, *viz.*, that relating to the cultivation of flax in the Punjab as a fibre-producing plant.

Considerable care had been taken in circulating, to all parties, precise instructions regarding the mode of sowing country linseed, with the hope that, by sowing thickly, a length, suitable to the production of a merchantable fibre,

might be obtained, and, wherever those instructions were attended to, which, however, was only done in the least numerous cases, the result was to a certain extent satisfactory, so that 110 maunds of respectable fibre were produced under the immediate superintendence of Mr. L. Steiner. This quantity was readily purchased by the enterprising firm of Messrs. W. H. Harton and Co., of Calcutta, who lose, as is well known, no opportunity of doing all in their power to assist in eliminating the fibrous produce of India.

But, as a general rule, it was found that the zemindars had so entirely neglected the tenor of the instructions communicated to them, that a great proportion of the plant was found, on examination, totally unsuited to the production of even a decent fibre, and *in no one instance* would the zemindar exert himself to the extent of *attempting even* the preparation of any fibre, although the difficulties in the way of doing so are by no means great. This preparation of fibre is, however, an operation requiring labor, and *labor* is what the Punjabee cultivator dislikes of all other things, if he can possibly avoid it, a fact that points to the desirableness of introducing machinery on an extensive scale, leaving the country people to cultivate and increase the growth of whatever, of a vegetable character, may be applicable to the arts of Europe.

It may not be out of place here to draw a brief comparison between field operations, say in the Punjab, and the same in England, and the tendency to that inertness which is so fatally opposed to progress will be more apparent. The cattle of the English farmer are tended with the utmost care, stalled, curried, watered, and fed, before the owner thinks of his own meals. The wretched bullock of the Indian cultivator is, on its return from its labors in the field, unyoked by its owner, turned adrift for a few hours, to seek what little pasture he can gather, driven home to chew a few seers of hard *kurbee* (stem of the joar, &c.), carelessly cut, and may be a seer or

so of cotton seed, or gram, if any be available. He is left to lie all night in his dirty byre, uncleaned and uncared for, and driven, next morning, to the field, yoked to his plough, and again made to work, till his master is tired of walking after him. The ploughman's labor in England is heavy; in India it is mere play. The thrashing of grain at home again is laborious; in India the miserable bullock is called on to perform the operation. The wretched choora or sweeper, not allowed to live within the village precincts, which he would pollute by his presence, so loathed that his very shadow defiles the self-sufficient Hindoo, must winnow the seed and carry it to the village for a trifling pittance of grain, much more frequently promised than given.* His easy ploughing, sowing, and reaping over, the Indian cultivator considers it his right to rest from his task, instead of employing himself, as the English husbandman does, in draining, fencing, clearing, or trenching his land, or devoting his time to in-door labor of various kinds. The highly important question of manure, and its various sources, is entirely beyond his comprehension, and instead of storing and applying it with the utmost care, he burns it, or sells it to the brickmaker, and thus loses a main element of agricultural success. (This question of manure ought to become one of material consequence in all attempts at improvement.) The Indian, or more correctly speaking, the Punjabee, in fact, does not know what labor is. No wonder he prefers sitting smoking his hooka, now and then peeling his *sunn* stems by way of a change, to standing up like a man to break and scutch flax or any similar profitable but distasteful occupation. He may be brought to grow the plant, but I much fear that is all for the present at least.

*The condition of these unfortunate people is such as to deserve the attention of the authorities. It is far worse than that of the unfortunate Helots of the Lacedemonians, and infinitely below that of the well-fed and well-cared slaves of America.

All the flax that was prepared was so prepared at Lahore, by hired labor, and I am, in addition, bound to state, with regret, though without surprise, that not one fibre of the flax produced since the season under review has been prepared by the cultivator, with the exception of a small quantity I found at Deenanugur, and which I brought to the notice of the Society some time ago.* It shews that the cultivator can produce flax if he choose. This is certainly a very discouraging fact, that militates considerably against the ultimate success of the efforts still made to encourage flax cultivation, which efforts have recently received such a stimulus by the reports from home, and which I venture to repeat, must be met by the introduction of scutching machinery.

I mentioned above that a small plot of flax land, sown with English seed, fortunately escaped the hailstorm. The fibre, obtained from the plants there raised was so very superior, as to confirm the previous conviction that the importation of seed was desirable, while a plot, sown with acclimated seed of some years' standing, proved that such seed does not deteriorate as rapidly as is the case with vegetables and flowers. The fibre obtained in both cases was long, soft, and stronger than that from the country produce, but nevertheless the difference was not so great, in my present opinion, as to make the importation of seed from Europe a *sine quâ non*, considering the risks that must attend that operation. Seed has been at various times sent out to the Punjab, but packed in such a careless manner, and forwarded under such disadvantages, as to period of transit, that the whole was found, on arrival of the several consignments, so totally unfit for agricultural purposes as to be sold as an oil-seed.

IV.—None of the conditions prescribed by Government, when promising certain premia, having been complied with, it became a question whether any reward should be given. I

* See *Proceedings*, Vol. X, p. 134.

thought it desirable, however, to recommend the distribution of a certain amount over the country, more as an encouragement for the future than as an acknowledgment of past success; and the sum of Rs. 1,491 was accordingly apportioned in rewards to those who appeared most deserving of consideration. It is to be regretted, however, that, owing to official delays, these premia did not, in most instances, reach the hands of the cultivators till eighteen months and two years after award, when all interest in the matter had almost ceased in many parts of the country, a delay causing much injury.

In conclusion of this report, not only did I consider the general result of the experiment such as to warrant its continuation, under modified circumstances, but strongly recommended that steps should be taken for ascertaining how far the cultivation of other fibre-yielding plants, suitable to the climate and soil, such as sunn, sunocra, *(Hibiscus cannabinus,)* hemp, &c., should be forwarded, with the view to inducing a large produce, calculated effectually to increase the exports of the Punjab.

The Report also passed in review the financial portion of the experiment, showing, as near as possible, that the Government had realized, in hard cash, upwards of Rs. 3,000, while the stock in hand was valued at some Rs. 3,000 more. I did my best to pay a just tribute to the value of the assistance I received at the hands of Mr. L. Steiner, without whose aid, in fact, the experiment must have fallen to the ground.

I will now proceed briefly to review what has been done since what may be called the year of the great Flax operation. In the Punjab Report of 1854-55 and 1855-56, after giving a resumé of the proceedings for 1855, already passed in review above, Sir John Lawrence says:—"In 1855, [the autumn of that year of course is here meant] about 25,000 acres [of linseed that is half the superficial area sown in 1854-55] were sown, but the season being dry, was unpropitious—*no merchantable flax was obtained.* * * * The experiment also

may serve as a basis for some sound conclusions. It appears that in the Punjab linseed can be produced, even on second-rate lands, without any great effort or cost, and may be either sold on the spot, or exported with advantage, so that the culture would be fairly remunerative to the growers. But the production of fibre is a much more difficult matter; care, intelligence, cost, trouble, good soil, fairly irrigated, are all required. There must be, firstly, good stems, and, secondly, skilful preparation of the fibre. Both objects are probably beyond the ordinary power of a Punjabee farmer; and then, if he were successful, it might happen that the same soil and culture would have produced superior crops, more valuable even than flax.* The thing can, however, be done, especially with the advantage of European seed. There are several districts which offer natural facilities, and in which it is probable, that farmers may be found who, with suitable encouragement, both will and can grow flax; and thus eventually a new product may be introduced into a province where such staples *are much needed.*"

Without stopping here to enquire why this suitable encouragement has not been afforded (or I ought, more properly to say, continued, for the action of the local and Supreme Government, was, in the first instance, all that could be wished), in a province where such staples are much needed, the Agri-Horticultural Society of India, will, probably, be somewhat surprised to learn that, so far from no *more merchantable flax being obtained* from the sowings of 1855, the very fibre which has attracted so much attention at Belfast, in Dundee, and at Leeds, was prepared from flax grown in the districts of Goojranwalla and Lahore, *during the season of* 1855-56! Mr. L. Steiner, whom I have mentioned, was continued as Superintendent, and did all that in

* It is difficult to say what crop is likely to yield a better return in the Punjab, or anywhere else, than flax, the gross return on which will never be less than from 15 to 18 Rupees per beegah.—H. C.

him lay, under the immediate supervision of Mr. McLeod, the Financial Commissioner of the Punjab, and of Major Clarke, Deputy-Commissioner of the district of Goojranwalla, who took an especially warm interest in this experiment. He obtained the sanction of the local Government to make certain small advances to the zemindars of suitable parts of his district, and induced them to undertake the cultivation on a small scale in the manner most likely to secure success as to length of fibre. Mr. Steiner saw the whole prepared himself; and it is an especially noticeable fact, that, although a small portion of that flax was grown from acclimatized seed, *the greater portion was obtained from country seed,* of which it has been constantly asserted that it is unsuitable to the growth of a stem of sufficient length for the production of good fibre. Here is another of the supposed difficulties in the way of the cultivation overcome. The produce of Mr. Steiner's operations, (I do not know the exact quantity, but I believe it was about 55 maunds,) was forwarded to England and Scotland, but suffered various detentions by the way. It reached its destination, however, in time, and fell into the hands of Messrs. Preston and Co. of Belfast, and was by them distributed in various quarters. Several linen-manufacturers of that town proceeded to test the quality of the flax, by having it prepared and spun into yarn, and a special meeting of the Council of the Chamber of Commerce of Belfast, was held on the 10th September, 1858, (so long was the fibre in reaching England) to consider the question of the growth of flax in India, and two bundles of yarn, spun by Messrs. Ewart, from the flax in question, were laid on the table for the inspection of the Members present. At this meeting Mr. Ewart, junior, estimated the value of the flax, from which the yarn was obtained, at £35 per ton, while Mr. Carter, another manufacturer, estimated the bale that had been sent him, supposed to be the best of the consignment,

at £45, but it was stated that both valuations were, owing to the short supply, above the ordinary market rates. Much was said of the formation of a Company, of assistance from the Government, and of the desirability of encouraging the growth of flax in India, owing to the short supply elsewhere. One of the members suggested that a commission should be sent to India at the joint expense of the Chambers of Belfast, Dundee, and Leeds, but no definite resolution was adopted, beyond a record of the then market value of the flax, at from £34 to £45 per ton. I may remark here that the estimated price of the flax in the Punjab and at Kurachee was represented to the members to be much lower than it can ever be, under the most favourable circumstances. A much more practical meeting was held at Dundee on the 29th September, of the same year, and as the report of the meeting is of much interest, and contains much that may be useful to those who may wish for information on the subject, I shall, with your permission, extract it in full:—

"*O. G. Miller, Esq., Chairman of the Chamber*, said, the principal matter which had engaged the attention of the Directors, since the last meeting of the Chamber had been these Indian fibres. Some time ago twenty bales of Indian flax had been sent to Belfast by Colonel Burnett, who had attended a meeting of the Belfast Chamber of Commerce, and submitted certain information to them. The Secretary of the Belfast Chamber of Commerce had forwarded to the Dundee Chamber a copy of the proceedings at the meeting in Belfast, and had asked them what they in Dundee were willing to do in the matter? The Secretary of the Belfast Chamber of Commerce had also sent eight bales of the Punjab flax to Messrs. Paton and Fleming for examination in Dundee. He (the Chairman) had carefully examined these bales himself, and found a considerable variety of quality in the bales, and, indeed, in the same bales two or three kinds of flax. He found the qualities easily divisible into three kinds. He had caused part of each to be hackled, and specimens of the dressed lint to be laid upon the table for the inspection of the meeting. These specimens, he considered, afforded a good idea of what kinds of yarn could be spun, from this flax, and of its value. The lint labelled No. I, was from the best and finest quality of the flax, and the produce of lint fron that quality was 55lb. to the cwt.,

and could easily be spun into 22 lea yarn. The first or roughing tow of this flax would spin into good 8 lea yarn, and the second tow into 16 lea. He valued this duality of flax accordingly at £48 a ton. The quality labelled No. 2 was rather of a harsher description, but really good flax; the yield of lint from it was 58lb. to the cwt., and was well adapted for spinning 20 lea yarn; the first tow being suitable for 8 lea yarn, and the second for 14 lea yarn. He valued the flax of this quality at £46 per ton. The third quality would be found to be of a dry, strong, and harsh nature. The yield of lint was 57lb. to the cwt., and not unsuitable for 16 lea and heavier yarn, the tow being adapted overhead for 8 lea. He valued this quality of the flax at £38 per ton. The fair value of the flax at the present time he considered to be fully £45 a ton overhead, and he would be glad to take a quantity of it at that price. The meeting would understand that, in speaking of the grists of yarn into which the flax could be spun, he referred to dry spun yarn. Into wet spun yarn it would of course spin into finer sizes, and go much farther. He should state, however, that he would not attempt to spin this flax by itself. This might be done, but it would not spin well by itself, and the yarn would not be satisfactory. It would serve well, however, to mix with other flax of a softer and kindlier character, which the Baltic flax generally was. Indeed a mixture of this flax with that of the Baltic would much improve the yarn *by imparting strength* to it.* Such flax would therefore be admirably adapted for canvas yarn, and other yarn, where great strength was required. Every one then would agree that, if a supply of some thousand tons annually of this flax could be obtained at a fair price, a very great boon would be conferred upon the linen manufacturers of this country, and this district, in particular, would be benefitted more than Belfast or any other town, for we have a hold of the coarser end of the linen trade, for which this flax was better adapted than for the finer spinning of Belfast and Leeds. Satisfied, then, that such flax as this could be largely and advantageously used by us, the question came to be, what are you willing to do in the matter? He observed that, at the Belfast meeting on the subject, there were two suggestions, the one that a joint-stock company be established, and the other that a commission for enquiry into

* A singularly valuable testimony on behalf of the Punjab flax. Strength in fact seems the great characteristic of flax and of sunn, as exemplified in the case of the so-called Kangra Hemp, found stronger than any fibre tested along with it. Mr. R. Saunders, Dy.-Commissioner of Kangra, was so good as to obtain for me samples of sunn from Koloo, which I found of such extraordinary strength as to draw the especial attention of my correspondents to it.—H. C.

everything connected with the subject should be sent to the Punjab, and that the merchants of Dundee and Leeds might join those of Belfast in doing so. As to the first, he did not consider that the establishment of a joint-stock company for such a purpose would be at all an advisable undertaking for flax-spinners to embark in. At all events he would not himself choose to be a partner, for, after paying salaries such as are expected in India to managers, secretaries, and overseers, and other employés of a joint-stock company, and other heavy incidental expenses inseparable from such, he would have little hope of moderately-priced flax from it, and still less, of any dividend. As to the other proposal—*viz*. a commission of inquiry to the Punjab, he thought that was unnecessary, because Colonel Burnett had already supplied the principal information. Colonel Burnett had shown the quality of the flax that could be grown; he had stated that the Indian Government was ready and anxious to encourage its growth by every means in its power, to afford every facility for its transmission, and to give land free in any quantity for its growth.* That land would, in all probability, be virgin soil,† which, it is well known, is the best adapted for the growth of flax; and, what was the most important of all, he had stated that flax, such as that lying on the table, could be laid down in Bombay at £25 a ton,‡ which at present was well worth £45 per ton in this market. (Hear, hear.) The trade were aware, however, that flax at the present time was unusually high in price, and that it would not in ordinary years bring so much money; but he had no doubt the meeting would agree that, in years when flax was very moderately priced, such flax as this would readily fetch overhead £40 per ton, thereby affording a profit of £7 per ton, after allowing £8 per ton for freight and insurance.§ Indeed, the present value of the flax, and the present low rates of freight from Bombay, would

* It is hardly necessary for me to say that Col. Burnett, to whom otherwise much credit is due for bringing the subject prominently before the people of Belfast, must have been laboring under a misconception when he stated this. So far from the Government, having granted land free of rent, they are "considering" the question submitted to them in December, 1858, whether any European shall be permitted even to purchase land on any terms "in fee-simple;" the opinion of the Lieut.-Governor of the Punjab on this very question was only asked on the 1st August of this year.—H. C.

† Some such soil may be found along the margin of the Baree-Doab Canal, when it is permitted to flow, but *when* that may be, it is difficult to say, seeing that *all* public works in the Punjab, are at a dead stand-still. Elsewhere no such land will be available.—H. C.

‡ I have already stated, and repeat, that it is impossible to lay down flax at Bombay at £25; £32 would be much nearer the mark.—H. C.

§ Much too high an estimate; £5 would be nearer the mark, at present rates of freight from Bombay to England.—H. C.

leave a profit of more than double that amount, or upwards of £16 per ton. With reference to the cost of transit, it had occurred to him that a considerable saving might be effected by the flax being shipped at Kurachee, which had been, or was to be connected with Hydrabad on the Indus, by means of the Sind Railway (and by and bye with Europe by the electric telegraph). He could see no occasion for taking to Bombay flax the produce of the Punjab, if the destination of the flax were to Europe. The port of Kurachee was certainly the most natural and least expensive route by which the flax could be sent to this country.* Having made these remarks upon this important matter, he would only farther say that he would be ready and willing to bear a share of the expense of a commission of inquiry to the Punjab, if he could see any good to arise from it, but he would certainly not consent to become a partner of any joint-stock flax-growing company. What he would do, however, and that most readily and cheerfully, and he felt assured that every flax consumer in this town and district would also be prepared to do it, would be to purchase largely if he had only the opportunity, of flax similar to those samples from India, and he had already shown, from the data furnished by Colonel Burnett, the high and remunerative prices they could afford to pay for it. In this town and district we could use many thousand tons of such flax. He could not, therefore, conceive a finer or more legitimate field for enterprise. (Hear.) The Government of India tendered free land for its growth in any quantity, land admirably adapted for the cultivation of this valuable fibre, where labor was cheap and plentiful, whilst here there is always a ready, and at the present time, indeed, there was a starving market for the article. It would then be most surprising if so golden an opportunity should not eagerly be taken advantage of. For many active young men it was a first-rate chance, and he had no hesitation in recommending it to their consideration. Twenty-five years ago jute was first brought into this town under auspices very different from this Indian flax. (Hear.) Almost every one at first looked upon it with disfavor, and it was thought for a considerable time that nothing could be made of it. He need not remind them of the rapid annual increase with us of that article, and of the important part it now held in our manufactures, the quantity imported to this country now reaching fully forty thousand tons annually—upwards of thirty thousand tons were annually used in Dundee. The reception now given to this Indian flax was

* The conclusions arrived at by Mr. Miller in this respect are most correct, but he is not aware of the difficulties attending steam communication between Kurachee and the Punjab which is in the most wretchedly inefficient condition imaginable

very different. They all at once pronounced in its favor, and were ready to purchase and pay for any quantity of it, and no end of machinery was ready waiting to spin it. With these observations he would be glad to hear any member on this important subject, and he would be glad to submit certain resolutions to this meeting, if no other member was prepared to do so.

In answer to Mr. Buist—

*The Chairman* said he had written to Colonel Burnett, asking if there was any chance of his being in Dundee, and intimating that the Chamber of Commerce were to meet and discuss this matter; but he had rereceived no answer to his letter. It was probable that by this time Colonel Burnett had returned to India.

In answer to Mr. Buist—

*The Chairman* said that he understood the flax was grown from Russian seed* and not from Indian seed.

*Mr. David Baxter* thought it would be difficult to over-rate the advantages that would accrue to this town in particular were a new field to be opened up, where they could derive a supply of from 5,000 to 10,000 tons of flax, and even more than that, annually. (Hear.) He thought that what the Chairman had stated as to the value of the flax in question was very correct. He did not know that it would be of any advantage to spin that flax so fine as the Belfast people did, or even as the Chairman himself proposed. But he thought the flax would be very suitable in Dundee for ordinary purposes. It would be worth at present about £48 a ton, and on an average of years its worth would be about £40 a ton. He was not aware if there was any more flax, beyond probably a few tons, in the Bombay market; but if the Indian Government were to take up this question, and grow flax in that country of a quality equal to the samples now on the table, they would get a demand for any quantity of it they might grow for many years. So long as the production of Indian flax kept under ten, fifteen, or even twenty thousand tons annually, there could be no difficulty in getting an outlet for it in this country, and chiefly in Dundee. It would be much more important to Dundee to be able to obtain this flax than either Leeds or Belfast, as it was more suitable for the Dundee trade than for that of Leeds or Belfast. There could be no doubt whatever that parties growing this flax would receive an abundant demand and a ready sale for it in this country. With regard to the encouragement to be given by them,

* I do not know on whose authority Mr. Miller could have stated this. The greater portion of the flax at the time before him was reared from local seed.—H. C.

he did not see what they could properly do.* They were consumers, not growers, and for the consumers of flax in this country to enter into a joint-stock concern for the growth of flax in India, would be quite out of the question. The thing they only could do was, as he had already stated, to resolve that the flax now submitted was suitable for them, and that they would be glad to see a plentiful supply of it sent over to this country, and would ensure the growers a ready sale for it. India would be as much benefited as this country from the growth of this flax, and he hoped the Indian Government would not lose sight of the matter. He (Mr. Baxter) would be happy to hear the resolutions proposed by the Chairman, and to second them if they were in accordance with his remarks.

The Chairman then proposed the following resolutions for the adoption of the Chamber:—

"*1st*, That the Indian flax, samples of which have been submitted to this meeting, is well adapted for the staple trade of Forfarshire; and is at present of the value of £45 to £48 per ton, and, on an average of years, £38 to £40 per ton.

"*2ndly*, That fully 10,000 tons annually could be advantageously used in this district, where there would always be a market for it, at prices in general highly remunerative to the grower, judging from the data recently furnished by Colonel Burnett, Secretary of the Agricultural Society of India,† to the Belfast Chamber of Commerce.

"*3rdly*, Understanding that the Indian Government is desirous to encourage the growth of flax in the Punjab, by giving land, for that purpose, rent-free, for a few years certain, and afterwards at a low rate, and otherwise, by rendering every facility for transport of the flax for export, a wide and profitable field of enterprise is opened up for many persons both in this country and in India.‡

"*4thly*, That it be remitted to the Directors to memorialise the Indian Government on this subject, with a request that the Government issue a prospectus containing as much information as they can supply for the guidance of such persons as may be willing and desirous to embark in such an undertaking.

* There is another thing these gentlemen could do. Let them send orders to the Punjab for a given quantity of flax, and authorize their Agents to pay for the same on delivery at Kurachee, or give authority to draw against the Invoice to the extent of two-thirds or three-fourths of its value.—H. C.

† A slight mistake, should be Secretary to the Agri-Horticultural Society of the Punjab.—H. C.

‡ As already stated, this Resolution is founded on a serious misconception.

"*5thly*, That the promotion and increase of the growth of flax in India would be productive of vast benefit to the native population of India.

"That a copy of these resolutions and of the other proceedings at this meeting, be forwarded to the Belfast Chamber of Commerce, as an answer to the communication from that body."

The resolutions were unanimously agreed to.

In reply to a suggestion from Mr. Buist, as to whether the Chamber might not send the memorial to the Indian Government, or to Sir J. Lawrence—

The Chairman said he had no doubt that the new Indian Council would be found disposed to pay more attention to this matter than the old Company. The Directors had a long correspondence with the East India Company on the subject of the cultivation of flax in India, but nothing came out of it. They would again earnestly take up the matter and endeavour to carry out the views of the meeting.

Mr. Neish said, that as reference had been made from the chair to the difficulty that was experienced in getting jute introduced here, he might state that he was the first to bring jute here. He kept a quantity of it beside him for upwards of twelve months before any body would try it. The old firm of Bell and Balfour kept what they had of it so long that they had to make door-mats of it. (A laugh.) They sold it at £11 a ton, and the same quality of it was now sold for £22 or £23. He observed that in England, when they wished any thing properly done, they sent a deputation to lay the matter before Government. Now, if Mr. Baxter and their Chairman could be prevailed upon to go to London—at the expense of the Chamber, of course—and lay the whole case before the new India Board, he thought the Chamber would effect their purpose much better than by merely petitioning. Two such extensive consumers as Mr. Baxter and the Chairman would be sure to be listened to by the members of that Board.

Mr. Baxter thought Mr. Neish's suggestion a good one so far, but he did not think that either the Chairman or he should go to London for the purpose stated. If any member of the Chamber happened to be in London, it might do good to call on the Board and enforce the views of the Chamber in regard to Indian flax.

Mr. Buist suggested that Mr. Neish confine himself to proposing that the Directors enter into communication with the new Indian Government.

Mr. Neish proposed to leave the matter altogether in the hands of the Directors, which was unanimously agreed to.

Printed for circulation in this country and in India, by order of the Directors of the Dundee Chamber of Commerce.

R. STURROCK, *Secretary.*

*Dundee, October,* 1858.

---

The following is a Copy of the Memorial forwarded by the Chamber in accordance with the Resolutions adopted at the Meeting:—

UNTO THE HONORABLE THE COUNCIL FOR THE GOVERNMENT OF INDIA, THE MEMORIAL OF THE CHAMBER OF COMMERCE OF DUNDEE SHEWETH—

That the flax-spinners and linen manufacturers of this country are almost entirely dependent upon other countries, and chiefly upon Russia, for the supply of flax.

That flax-spinning and linen manufactories in the United Kingdom have of late years largely increased in number and extent; but the average annual supply of flax has not increased.

That Russia and other flax-growing countries have themselves, of late years, become large consumers of flax.

That there is thus an inadequate supply of flax for the actual and prospective demand in this country.

That the flax-spinners and linen-manufacturers of the United Kingdom have, for many years back, considered that a supply of flax might be obtained from India; but, for want of some organised system, either in this country or in India, no material progress has hitherto been made towards the cultivation of flax in India for the sake of the fibre, although it has been cultivated to a considerable extent for seed.

That your Memorialists understand that your Honorable Board are now desirous to promote the growth of flax for manufacturing purposes; and your Memorialists recently had an oportunity of seeing and testing some samples of flax grown in the Punjaub.

That Meetings, both of the Chamber of Commerce of Belfast, and of this Chamber, have been held, at which these samples were submitted, and were found to be very suitable for the linen trade of this country. At these Meetings, also, a strong desire was evinced by those present to become large purchasers of such flax, if it could be obtained.

A copy of the report of the proceedings that took place at the Meeting of this Chamber on the subject accompanies this Memorial.

May it, therefore, please your Honorable Board to take into your consideration the propriety and expediency of adopting such measures as your Honorable Board may deem best calculated for promoting the growth of flax in India for manufacturing purposes, and of issuing and circulating such prospectus, or other appropriate document, as may conduce to the information and guidance of such persons as may be desirous to become connected with the growth of flax in that country; or to do otherwise and farther in this matter, so important both to this country and to India, as to your Honorable Board in your wisdom, may appear proper.

And your Memorialists will ever pray, &c.,

Signed, in name and on behalf of the Dundee Chamber of Commerce, by

O. G. MILLER,
*President of the Chamber.*

*Dundee, 15th October,* 1858.

---

The memorial was duly presented to Lord Stanley, but did not meet with the success that it seemed entitled to. A second meeting of the Dundee Chamber was held on the 5th January, 1859, and I again venture to give the report of the proceedings in full for the reason above given, and I give it here because, although so recently held, the discussion still related to the first despatch of Indian flax made to England, which it reached nearly two years after manufacture during the year 1856.

*Mr. O. G. Miller, President,* was in the Chair—The meeting was held for the purpose of considering a reply received from the Council for the Government of India to the memorial of the Chamber relative to the cultivation of flax in India. In that reply it was stated that Lord Stanley appreciated the great importance of the object which the memorialists had in view, and was most anxious that no means to the end should be wanting which were within the proper province of Government. The Indian Government had already done much to encourage flax cultivation, and as the experiments made had fully proved the capability of the soil to grow good flax, the cultivation of the plant and its introduction in large quantities into this country could only be looked for as the result of a well-organised system of private enterprise,

which must be brought to bear directly on the cultivation of that article in India.

*Mr. O. G. Miller* said—The subject which would now occupy the attention of the meeting, was one of vital importance to the linen trade of the Company generally, and for the reasons stated at the last general meeting of the Chamber, particularly so to this town and to Forfarshire. The Directors, in obedience to the remit to them at that meeting, prepared a memorial to the Council for the Government of India, in regard to the cultivation of flax in India, the presentation of which, our respected member for the burgh, Sir John Ogilvy, who, he (the Chairman) felt assured all present were most happy to welcome here to-day, had been kind enough to undertake. An answer to that memorial was received from Lord Stanley, which had just been read to the meeting. The substance of it shortly was, that the Council, whilst admitting the vast importance of a trade in flax being established between India and this country, considered that they must leave it to private enterprise to carry it out. He (the Chairman) had felt very hopeful, from the apparent anxiety of the new Indian Government to foster and encourage the growth of flax in India, as represented by Colonel Burnett at the meeting which he attended, of the Belfast Chamber of Commerce, that a more favorable answer to the prayer of our memorial would have been given. He had some expectation that the Council would have of themselves proposed to take some active steps towards promoting the object. He was led to expect that they were ready to grant land free of rent, and afford every facility for transmission of the flax for shipment, but they do not in this answer give any positive assurance of such assistance. He confessed that his disappointment, and that of every one interested, had been very great at the result of the memorial. Since the answer, he had had much anxious consultation as to our next movement, with our most obliging and active member, Sir John Ogilvy — with Lord Duncan also, the member for Forfarshire, who, with his accustomed energy, had entered most heartily into the subject—with Mr. David Baxter also, who seconded the resolutions at last meeting, and who had since bestowed much attention on the matter. They were all agreed that it was most important to obtain the countenance and assistance of the Indian Government. Both Lord Duncan and Sir John Ogilvy were clearly and decidedly of this opinion, and strongly recommended that another application to the Indian Government should be made specifically, stating what the trade desired and expected the Government to do; but he would not propose that the application should be made merely by this Chamber. The time had now come,

which rendered it imperative upon all persons interested in the linen trade of the United Kingdom, to form themselves into an Association for the single purpose of increasing the supply of flax to this country, to meet the growing wants of the linen trade. From all that could be learned, and from the successful experiments that had been made, certain districts of the Punjab in our own Indian Empire were the most likely to be available for the purpose, and it ought to be there that the efforts of the Association should first be directed and confined. He (the Chairman) was himself ready to become a member, and to take his share in the trouble of forming such an Association, and he hoped that many of those present would agree to become members. It would not, however, be mere names that would be required, a large sum of money would be needed—for the duties of the Association would be to publish widely in those districts most likely to be flax-growing, statements of the value of the fibre, and statements also showing the mode of cultivation and management of the plant and preparation of the fibre. It would be the duty also of the Association to engage some persons who were practically acquainted with the cultivation of flax and preparation of the fibre to instruct the natives. It would be of importance that such persons should be able to speak the native language; and if one or two skilled persons from Ireland, where flax was so well understood, could be found to go out, it would be of the greatest advantage to send them to the Punjab. Another main object for which a considerable amount of the funds of the Association would be required, would be for premiums, as an incentive to such landowners and farmers as would grow flax, to be awarded in such a manner as might be determined—so much, for example, to the person who might put the greatest extent of land under cultivation for flax, subject, of course, to certain rules as to thick sowing; so much to the next; so much, again, to him who might produce the largest quantity per acre of flax fibre; a premium, again, to him who produced the best quality of flax, and so on. He was quite aware that, generally speaking, the question of fostering any trade by means of premiums was one of doubtful expediency, but for his part he would be willing to run the risk of expending in this shape a portion of the funds of the Association. These were a few of the main duties of the Association, but others would naturally arise. One most important point would require to be kept in view, and that was, that the growers of the flax themselves should from time to time be made cognisant of, and should obtain the fullest value that could be afforded for their produce, in order to encourage them to continue the culture. He often heard it alleged

that the best means by which our object would be attained, would be by a joint-stock company, but in his humble opinion such would be the very means whereby the object would be defeated, because dividends with a joint-stock company were the first object, and after satisfying these, and the great expenses attending a joint-stock company, there was little chance of the growers receiving sufficient prices to induce them to continue the cultivation. If flax, such as they had on the table at last meeting, could be laid down at Bombay, as stated by Col. Burnett, at £25 per ton, not at Kurachee, where it could be laid down for considerably less money* he could only say that the grower of it was very much underpaid, and very naturally would be discouraged, and would decline to undertake a similar crop another year. He (the Chairman) got a portion of the Indian flax, for which he paid £45 per ton in August or September last, before prices had risen to their present high pitch, and he found it even then very good value. The freight from Bombay was then about £4 per ton, but assuming that £5, including insurance, were required at the time to bring it home, that would make the flax stand £30 per ton here. Well £30 from £45 left £15, he only wished that that sum, or a good share of it, had been left in the hands of the grower, for then he would no doubt have again had his land under crop for flax fibre. At present the value of flax similar to the samples submitted to last meeting could not be estimated at less than £55 per ton overhead, flax having risen in price since that time fully £10 per ton. Regarding the kind of agency and assistance which the Association should demand of the Indian Council, that would be for the Association to determine. He would suggest that it should be something specific and distinct. It would not be too much, for example, to ask them to undertake to send, to those districts of the Punjab most likely to be flax-growing, a supply of suitable sowing linseed† to be sold in the Punjab by their own government agents at cost price. It would not be an unreasonable request to ask the Council to do so for at least two or three years certain; or the Council might reasonably be asked to continue the system pursued by the East India Company of granting premiums. On examining the reports it would be found that the old Government had expended very large sums in this way,

* The difference would not be more than the freight, a small incidental charge between Kurachee and Bombay.—H. C.

† Steps being taken to insure the arrival of the seed in a vegetating condition, which has hitherto not been done. Small invoices were good, which shews that the thing can be done; the larger was good for nothing.—H. C.

and in experimenting on very many different kinds of fibres, numbering not fewer than two hundred, and that being the case, the meeting would readily conceive that the valuable fibre of flax could not possibly have received that share of attention which it merited. Endeavours had been made for many years back, both in India and other countries, to find a fibre capable of taking the place of flax in our staple manufactures, but such endeavours had not been successful, and he humbly thought that it would be prudent for the Government to pause before expending more money on doubtful experiments regarding fibres generally, and second the efforts of the proposed Associations, especially towards that of flax. We knew what it was—our machinery was adapted for it—and our efforts ought to be concentrated upon it for years to come. Having mentioned the duties, or the principal ones, that would devolve upon the Association, and the duty which the Association might reasonably ask the Indian Council to undertake in this important matter, he would just add one word as to the duty of the flax consumers themselves generally, and that would be to send out their orders freely, when the proper time came, to respectable commission houses in Bombay or Kurachee, to procure and purchase flax for them. If consumers generally were to send out their orders for small quantities, say five, ten, or twenty tons, according to their requirements, without reckoning upon much advantage from the first individual orders, it would be one means of starting the work, and ultimately result in much benefit to themselves. The first and great point was to show in India itself that there were ready buyers for the flax at remunerative prices, and when the flax was grown, middlemen between these commission houses and the growers, would then naturally spring up, and provide the growers with money for their produce, and arrange and attend to its transmission for export—in short, whose business would be precisely similar to that of the Kreutzers, Vanukoffs, and others, who are the media of communication between the flax-houses of St. Petersburg and the peasants, growers of flax, in the interior of Russia. He felt called upon to say, however, that he was not sanguine in expecting that much early success would attend any efforts that might be made. The good work might well be begun, however, and some considerable quantity of flax might, within a year or two, be procured, and, after the railway and steam communication between Lahore, Umritsur, Mooltan, Hydrabad, and Kurachee were completed, and in full operation, he thought it not unreasonable to expect that a fair trade in flax with this country would be firmly established, and go on year by year

increasing. The Chairman having read or referred to a number of letters and papers received from Lord Duncan, Sir John Ogilvy, Mr. Dewar of London (who tendered his name as a member of the Association, and a subscriber to the amount of £500, or £100 annually for five years), Mr. Atkinson of Leeds, Colonel Sykes, the present Chairman of the East India Company, the Hon. R. Cavendish, Mr. Luhrs, of Archangel, (who alludes to the increasing consumption of flax in Russia for manufacturing purposes,) and others, then proposed the following resolutions for the meeting, viz :—

"1. That, with reference to the proceedings at last meeting of this Chamber, in regard to the cultivation of flax in India, and to the answer by the Council for the Government of India to the memorial transmitted to them, it is the opinion of the Chamber that an Association should now be formed of the merchants, flax-spinners, and manufacturers, and others of the United Kingdom interested in the linen trade, for the purpose of providing money and adopting measures for obtaining a supply of flax from India.

"2. That it be remitted to the Directors of the Chamber, as a Committee, with power to them, as such, to add to their number, to correspond with the Chambers of Commerce in Belfast and Leeds, and other places connected with the linen trade, and endeavour to procure their co-operation and assistance in this important matter."*

*The Chairman* then concluded by expressing a most earnest wish that the proceedings of this meeting would result in a united, vigorous, and successful effort being made to obtain an increased supply of flax to meet the requirements of the linen trade, in which their town and country were so deeply concerned, and which formed so important and necessary a branch of the national industry. He resumed his seat amidst applause.

*Mr. David Baxter* seconded the adoption of the resolutions. In doing so, he said—I am glad to see so numerous and so influential a meeting of the Chamber of Commerce, as it shows that the members are fully alive to the importance of the subject, which is one not simply of local but of national interest. This district, and the great consumers of flax in Great Britain, are no doubt specially interested in the matter; but as the linen trade is a national trade, any thing that affects the interests of that trade is of national importance. I think it is only due to Lord Duncan and Sir John Ogilvy that I should confirm all that

* Excellent Resolutions, no doubt, but doomed, like many others, connected with the Flax cultivation of the Punjab, not to be carried out, as I shall, unfortunately, have to show lower down.—H. C.

the Chairman has said regarding the interest taken in this subject by both of these gentlemen. I have had a lengthened correspondence with Lord Duncan, who has repeatedly gone to London from his present residence, and has had repeated interviews with the Indian Council on the subject, and have reason to know that he has done a great deal of good by his exertions. Sir John Ogilvy has attended this meeting, in order that he may be informed on the subject, and of the wishes of the Chamber, that he may be of use in promoting our views in his place in Parliament, and in bringing them before the Council for the Government of India. I was very much impressed at one time with the idea that the Old East India Company had done very little in bringing out the resources of India; but I find, from the official documents which have been sent to me, that this is by no means the case, and that the East India Company have done a great deal, and particularly that they had exerted themselves considerably with regard to the article of flax, although I am sorry to say that they have not been very successful. And now that the Government of the country is somewhat changed—and looking to the terms of the Queen's Proclamation recently published, which states that, as soon as tranquillity is restored, they have the earnest desire to stimulate peaceful industry—I think we are justified in looking to the Government of India for every assistance and every facility in prosecuting the work which we have in hand. And I may say that I do believe that no private enterprise whatever will succeed unless you have the countenance and support of the Indian Government, because they have in India a very large staff of officials, intelligent men, who know the resources of India, who know the language, and who can render assistance, without which it would be impossible for us to succeed.* I must state that there are very considerable difficulties in the way of raising flax in India; but I do not allude to these to damp your ardour in the cause, because I am quite satisfied that these difficulties can all be overcome. There is, first of all, the difficulty in the tenure of the land arising from the land-tax, which, however, does not so much apply to the Punjab—to which part of the country we are more particularly directed, as being more suitable for growing flax than any other part of India—as the land-tax only exists there to a very small degree. Then there is the difficulty of road communication. You will all

* With some exceptions, this is a true sketch of the anxious desire of the officials of the Punjab to assist in any good work of this kind,—and I trust that as their judicial labours have, recently, been much simplified, they may have more time to devote to matters of this kind.—H. C.

understand that, without facilities for bringing flax from the interior of the country to the sea-board, a great deal cannot be done. In Russia it is only in winter, on sledge roads, that flax is brought from the interior to the Baltic. So in India, unless with railroads, and steam navigation on the rivers, there will be great difficulty in bringing the flax to the sea-board. As railroads and canals are in process of construction, however, these difficulties will in a short time be removed. Then there is the climate. Flax requires a moist and humid climate; but India is not so, and you can only overcome this difficulty by means of irrigation, which is going on extensively in India. By means of irrigation the flax crop in India may be rendered more safe and more secure than in any other country, not excepting Ireland; because in dry weather you may always ensure your growth by irrigation. Then, again, there is the difficulty arising from the seed, which must in the first place, be procured from this country. I suppose that, in course of time, it might be acclimated, but for some years you would require a very large importation of seed from this country. But, probably, the greatest difficulty is the fact that an immense quantity of flax seed is grown in India. It is a very easy matter to grow flax seed, but a very difficult thing to grow flax fibre. In 1855 there was produced in India about 5,000 tons of flax seed,* but the straw which was produced was worth little or nothing for its fibre. Now, when they can procure a large return† from their land for the seed alone, which requires much less work in cultivation, you can easily see that it will be difficult to induce them to enter upon the careful cultivation of flax fibre. At the same time, seeing the great price that they may get for that fibre, I have no doubt that they may be stimulated to grow the flax in such a way as to produce a good fibre. Well, then, we have the matter a good deal in our own hands—that is to say, if Leeds, Belfast, and other places join us. I believe that singly we can do nothing, but if the other parts of England and Ireland, which are as deeply interested as we are in an abundant supply of flax, unite with us in the work, then I have no doubt that we can in the course of a few years, produce a large quantity of flax in India. Of course it will be progressive. We cannot have a large quantity all at once; but in a few years we might have 1,000 tons, and if we go on increasing, say 500 or 1,000 tons yearly, it would soon be a great advantage to the trade in which we are engaged. I have very much pleasure in seconding the resolutions proposed, and I hope

* 15,000 tons would be much nearer the mark, and double the quantity in 1857.—*H. C.*

† A return certainly, but not a large return.—*H. C.*

that the Committee of the Directors of the Chamber will give the subject their most earnest and anxious consideration.

*Mr. A. J. Buist* said it must be evident to them all that, with the increasing outlet for our manufactures, the supply of the raw material is not at all equal to the increasing demands of the trade. Now, although the present high price may to a large extent stimulate an increased supply of flax from the sources to which we have been accustomed to look, it seems evident that, unless we have a supply of flax from new sources, the linen trade cannot go on increasing as it has hitherto done. We cannot expect that Scotland will cultivate flax, as was at one time thought; the supply from Egypt has fallen off, Ireland is not increasing; and Russia is not increasing; so that, altogether, unless we can get a large supply elsewhere, the linen trade cannot go on increasing, but must rather retrograde. Now, it would seem very natural to us to suppose that if we were to show the flax-growers that flax was required, that that would be a sufficient inducement to them to grow flax, if flax was a suitable crop. But I am afraid this is not enough, and therefore I would cordially support the establishment of an association for the purpose of getting information, and of doing all that can possibly be done to stimulate a supply of flax. It is well that we should consider what really has been done in the way of stimulating the flax supply from India hitherto, so that we may not be disappointed if it requires longer time and more persevering energy than we perhaps anticipate, to get our object effected. Sixty years ago, from 1796 to 1797, twenty tons of hemp, flax, and twine, were sent from India to Great-Britain, while a hundred tons were sent to America. At the same period, nineteen tons of jute were sent to Great-Britain, six tons to America, and forty tons to Hamburg. During 1796, 1797, and 1798, the East India Company lost on sunn hemp sent to this country about £45,000; so that, although I cannot agree with Mr. Baxter in thinking that the half has been done which might have been, in developing the resources of India, yet we cannot say that the East India Company have been idle, or that we have been well informed as to all the experiments made. Now, looking to the increased supply of cotton from India—which now reaches from one-fourth to one-eighth of the whole supply—and to the immense supply of jute, which has increased from 628 tons in 1835-36 to 48,000 tons last year, we have every reason to hope that flax may yet be extensively cultivated in India, and profitably imported to this country. But there seems to be greater difficulties in the way than would at first be supposed. You would think that if you could show the native cultivator that flax is

profitable, he would at once agree to grow it for the sake of the increased profit. But such is not the case. I find, from Dr. Royle's book, that several attempts have been made, many of which failed, on account of the parties not being able to overcome the deep-rooted prejudice of the native cultivators. A great many experiments have been made in the cultivation of flax during the last 20 or 25 years; and although these experiments have been successful in several localities, yet Indian flax has not come to be an article of commerce to any very great extent. This meeting may not know that so far back as 1839 there was a company actually formed to promote the growth of Indian flax, and yet no results had been derived therefrom. It would therefore seem that constant and persevering efforts would be necessary to induce the regular cultivation of flax in India and its transmission to this country. We cannot hope that our Association, after it is formed, can produce large results in a short time. Flax in India is a winter crop, sown generally in November, and even though the association should be successful at the very outset, they could not get any flax sown before November, 1859, and it could not be here till November, 6180.* Now, in all human probability we shall have a large crop or two from our common sources of production before that time; and therefore we should not give the cultivators in India an idea that we could pay the present high prices for their flax, as it would probably come into competition with cheaper flax. I merely mention these difficulties, and allude to the experiments which have been made in India, in order that, in forming an association, we should not be disappointed at slow and small results at the outset. It will also be very necessary that we should be prepared to state to the Government what we expect. I do not say that we can expect an Indian Government to become growers or importers of flax, as that is not within their proper province. At the same time we are entitled to expect every facility from the Government to enable Europeans to acquire land or otherwise. In the Punjab the Government are not proprietors of land, but there are some parts of the country where the Government have land, and are willing to grant it on reasonable terms. We can also point to the Government of India that they have already been accustomed to give premiums in the Punjab to encourage the cultivation of flax; and to the fact of the Royal Society of Ireland receiving £1000 yearly from Government, is another ground for our expecting assistance

* It is almost needless to say, that all these calculations have fallen to the ground with the Association which was brought forward under such apparently auspicious circumstances — H. C.

for the same object in India. But unless we are prepared to put our hands into our own pocket, and to go perseveringly into this matter, I very much doubt whether we will receive any considerable supply for a long time. At the same time I believe that in India immense quantities of flax can be profitably grown if it is judiciously encouraged, and if European energy is brought into contact with native labour. If they were successful in attaining their object, they would greatly benefit the linen trade in this country, and at the same time confer a substantial benefit on the native population of India. I think it is of the utmost importance to the linen trade in this locality, and that we ought to pursue the subject with all possible earnestness. I hope we shall go practically about this matter, and that partly by Government assistance, but more particularly by our endeavouring to assist ourselves—(hear, hear)—we shall be able to get additional supplies of flax, so that the trade may not be subjected to the enormous fluctuations from the dearth of the raw material that has hitherto been experienced at frequent intervals. (Applause.)

*Sir John Ogilvy* said that, as had been explained by Mr. Baxter, he attended the meeting with the view of acquiring information, that when the proper time came for advancing the interests of the Chamber, he might be in a position to do so by every means in his power. As they had been already told, this question was of vast importance, not only to Dundee, the county of Forfarshire generally, and adjoining counties, but to the country at large, and on that account he felt it all the more to be his duty to do what he could for the promotion of this movement. As was very properly observed by Mr. Baxter, his friend Lord Duncan had, from the commencement, taken a most enlarged and comprehensive view of the question. He (Sir John) should be most happy, when he returned to London, by communication with the Association, which he trusted would now be formed, to impress upon the attention of her Majesty's Council for India the adoption of such steps as the Association might think it advisable to take. He of course quite agreed with the previous speakers, that they were not to expect the Indian Government either to become growers of flax or embark as merchants in the material. All they could expect from the Government was that they should lend all their legitimate assistance in the way of awarding to growers premiums of money, and in the other ways already pointed out. He was prepared to give the meeting any information he possessed, but as Mr. Baxter had derived his information from precisely the same sources as he had, and had already entered so fully into the subject, he (Sir John) would not detain them by

many remarks. He might state, however, that as the result of reading and personal enquiries, he was perfectly satisfied that although perhaps flax might grow at this moment in other parts of India, which, as respected fibre, would be better suited to the purposes of the merchants in Dundee and other places than that grown in the Punjab, still the Punjab was really the part where they might reasonably expect to obtain large supplies. He found that one of the greatest impediments to the growth of cotton had been the difficulty of transportation. He saw by one experiment instituted by the late Government (which did a very great deal in the matter), on one of the Government farms, on which cotton had been largely cultivated, that though the farm was only some 300 miles from Bombay, such was the difficulty of transportation, and the expense attendant thereon, that it actually took longer time to convey the cotton from the farm to the sea-board than to grow it. There were many parts of India where the same difficulty would not be felt. That difficulty was being removed in the Punjab more than in other parts. There were facilities there which did not exist in other parts.* After referring to the various water and other communications in the Punjab, Sir John said he held in his hand a blue book containing very full details respecting the province of the Punjab, during the first three years that that province was annexed to this country. That book shewed what had been done by the Government from the commencement, and the very enlarged views they had taken in the opening up of that important country. It was drawn up by two eminent and enlightened statesmen, Sir John Lawrence, and his late lamented brother. That document shewed that, from the very time the Punjab had come into our possession they devoted themselves to develop as completely as possible the resources of the country. In a very short time after the Punjab came into our possession nearly 1400 miles of large first class roads had been formed, besides a great extent of second and third class roads; and from later documents he observed that the work of constructing roads had been vigorously carried on, so that there were now many thousand miles of roads which would not only open up the export traffic, but would be available for communicating from all the important districts with Mooltan, whence goods could be transmitted

* They may be "looming in the distance," but certainly do not exist at present. We may hope that the Indus flotilla, in connection with the Sind and Punjab Railways may do something to relieve our present difficulties, but at present they are great *and increasing*. We Punjabees had hoped for much from the Oriental Inland Steam Navigation Company, but that association has, I am sorry to say, proved a failure.—H. C.

to the sea-board by the Indus. But the most important matter was that of irrigation. Sir John Lawrence and his brother seemed to have been impressed, from the very first, with the importance of irrigation in that very dry and arid country; and they had caused a survey to be made, and a canal to be constructed, which was expected to be finished in five years, from its commencement. From the last accounts that canal had been steadily going on, and it was to be available not only for irrigation, but, from one end to the other, for inland navigation. But the most important matter connected with this canal was, that it intersected a most important part of the country which would thus be easily irrigated. One of the greatest difficulties connected with the cultivation of flax in India was that of getting the natives to substitute one crop for another. In many places along the banks of the rivers, they found sugar, cotton, and grain of different kinds growing; and even although you endeavoured to show to the natives that it would be more profitable to grow flax instead of some of these crops, it was an exceedingly difficult matter to induce them to do so. In the Punjab, however, along the banks of this canal, this difficulty would not be felt, as it opened up a new field, where they would not have to displace another crop in order to grow flax, (Hear, hear) If the natives were shown the advantages which would accrue to them from the cultivation of flax, they would more readily give it a trial, as they would not have to displace other crops. Here, therefore, was a fertile country, with means of irrigation, and means of transmission to Mooltan; and there was every reason to believe that, if they could only show the natives that they will have a profitable market for flax, they would very soon be induced to cultivate it to a considerable extent. With regard to the tenure of land, the Government are not proprietors of land in the Punjab, but—thanks to the enlightened views of Sir John Lawrence and his brother—the land-tax had been commuted to a fixed payment of about 2s. 6d. per acre. There had been a great deal done for the encouragement of flax cultivation by the Agricultural and Horticultural Society of Bombay,* who had given premiums and in other ways tried to induce the natives to prosecute the growth of flax; and they had even obtained land themselves, and had been, in 1856 and 1857, engaging in the growth of fibrous plants, including flax. He (Sir John Ogilvy) thought the very best encouragement the proposed Association could give to the natives of India to cultivate flax, would be to purchase every pound of the fibre

* "Of the Punjab" is meant, I presume. The Bombay Society certainly never had any thing to say to the cultivation of flax in the Punjab.—H. C.

which the Society had grown, even supposing that at first they should not obtain any profit by the transaction, as by this means it would be shewn that the people in this country were in earnest, that there was a ready market for the article, and that it would be a profitable thing for them to engage largely in its cultivation. Sir John concluded by assuring the Chamber that he would be at all times ready to do anything in his power towards promoting the object of the proposed association. (Applause.)

*Mr. Thiebault* asked if it had not occurred to any member of the Chamber that an effort ought to be made to extend the cultivation of flax in Ireland, rather than seeking to obtain their supply from India? It seemed to him that what flax was grown in Ireland was raised over a comparatively small tract of country, probably over only one-fourth or one-third of the north of Ireland. The climate and soil of the south of Ireland was admirably adapted for the growth of flax, and yet, so far as he knew, flax was scarcely grown there at all, if they excepted a few patches which the farmers grew for their own use. There was an Association in Belfast for the promotion of flax in Ireland,* and he would suggest that the Association to be formed here should put itself in communication with the Association in Belfast, to see whether the growth of flax could not be increased in that country. By that means they might attain their object more effectually, quickly, and satisfactorily, than by the means they proposed adopting. They knew less of the climate of the interior of India than of the climate of Ireland. No class of people were more difficult to persuade to change their habits than the agriculturists. The natives of India must be worse to persuade in that respect than the agriculturists of Europe. The former had not had the benefits of enlightenment while the latter had In Ireland there were probably at least 750 Scotch farmers. If they could only show these farmers that it was their interest to produce flax, a plentiful supply of the material might be obtained, and with that view, he would again propose that the association to be formed here enter into communication with the Irish Society with respect to the practibility of the proprietors referred to, directing their efforts in that direction.

In answer to the Chairman—

*Mr. Thiebault* said that labour in Ireland was to be had at a cheap rate.

* Which has, I regret to say, been dissolved, why or wherefore, I have as yet been unable to learn.—H. C.

The *Chairman* said that the labour in Ireland was expensive as compared with what it could be had for in India, and this difference in the price of labour betwixt the two countries would make the Indian flax cheaper. The Belfast Chamber of Commerce were as anxious to obtain flax from India as they were. The last communication the Directors had from Belfast showed that, in effect, that Chamber had, in their memorial, echoed the memorial from this Chamber to the East Indian Government.

*Mr. Neish* said that perhaps it would meet Mr. Thiebault's argument to resolve that the efforts of the Dundee association be directed not only to obtaining a supply of flax from India, but wherever they could get the article.

*Mr. D. Baxter* said it would be a pity to mix up the matter referred to by Mr. Thiebault with that for which they were now met. That gentleman had alluded to the Association in Ireland. It was, no doubt a most efficient Association, and the members of the Chamber here might advance the object it had in view by each subscribing a guinea to it.

*Mr. W. Renny* believed that the half of the expense of flax grown in Russia was attributable to the cost of labour, and the charges of transmission. A great deal of flax was brought from Viatka to Archangel a distance of fifteen hundred miles by water, at an expense of something like 25*s*. to 28*s*. a ton for the whole fifteen hundred miles. Had it not been for that, they would not have had flax so cheap as they had had of late years. The same might be said all over Russia.* He had seen men getting in Russia about 4d per pood (36lbs.) for cleaning flax, and they could only do a pood a-day. Now matters would be different. Since the war in Russia labour had advanced, and in future they would not be able to produce flax so cheap, and it would be a great object now to get flax cultivated where cheap labour could be got. This Association ought, therefore, to direct its efforts to procure flax from countries where labour is cheap. As to seed, he thought any difficulty with regard to seed could be easily got over—in fact he doubted whether it existed. A part of the seed in Russia was unfit for sowing in consequence of being dried in kilns, by which its vegetating power was destroyed. In India there was much seed but no flax. The want of a humid soil rendered the fibre almost useless; but it was greatly sown for the sake of the seed, and he thought the climate

* Flax from the Punjab will never be delivered at Kurachee under more than double that sum, while the distance is one-third less.—H. C.

would dry the seed by the sun, so that it would be like Riga seed, which was sun-dried, and thus preserved its germinating power. A great many of the Archangel growers, although distant a thousand miles from Riga, procured the seed from Riga. The great matter with regard to seed was that it should be changed, and he thought that in India the country was so extensive that they could change the seed there, and would not require a large importation of Riga seed.*

*Mr. Buist*—The seed question has already been solved, for the best samples of Indian flax have been produced from native seed.

*Mr. Renny* corroborated the Chairman's statements as to an increased consumption of flax in Russia, in the northern districts. In a letter received from his brother in Archangel, he stated that their district would have to supply 10,000 tons of flax for the spinners in that quarter and for St. Petersburg.

*Mr. David Baxter* thought the increased consumption in Russia was over-estimated, and that a great deal of it was merely a substitution of mill-spinning for hand-spinning; but, after allowing for this, all accounts agreed in stating that there was an increased Russian consumption.

The resolution were unanimously adopted.

*Mr. Thomas Neish* proposed that a vote of thanks be given to Lord Duncan and Sir John Ogilvy for their exertions in connection with this subject; which was carried by acclamation.

*Sir John Ogilvy*, in acknowledging the compliment, renewed the assurance that he would be at all times ready to promote the wishes of the Chamber in this important matter, and stated that he had been personally indebted to Lord Duncan for his assistance not only in connection with this subject, but in every question involving the interests of the town.

It was finally resolved to make another attempt to interest the Secretary of State for India in the question, and I find the following account of the result in the papers of the day :—

An influential deputation from gentlemen in Scotland, interested in the growth of flax, had an interview on the 14th of February [1859] with Lord Stanley, in his capacity of Secretary of State for India, on the subject of the capabilities of India for the supply of flax to this country.

*Viscount Duncan, M. P.*, having introduced the deputation :—

*Mr. Miller*, Chairman of the Dundee Chamber of Commerce, stated that, from information which has lately been received in this country,

* Mr. Renny's conclusions on this head are perfectly reasonable and correct.—H. C.

there was every reason to believe that flax could be produced in India of fine quality and texture. Indeed, he had himself received a sample, which had been fairly tested, and was found to be admirably adapted for the manufacture of canvas for the navy. The British manufacturer was at present in a somewhat critical position with respect to the supply of the raw material. Neither Russia nor Ireland was likely to increase its production of flax; on the contrary, it was more than probable that, from the increased value of land, and the rise in the price of labor, the supply from those sources would be diminished. Last year the import of flax amounted only to 50,000 tons; whereas from Russia alone he had known the imports in former years to reach 80,000 tons. The question, then, was, how were the wants of the linen trade to be supplied? A committee had been appointed in Dundee, with a view to form an association for the purpose of encouraging the growth of flax in India, and they were anxious to impress on his lordship the great necessity which existed for improved means of transit, and of making some alteration in the tenure of land.

*Lord Stanley* said—As far as respects improvement in the internal communication of India I can only repeat that we are doing all we can to forward those improvements. The Government has been spending of its own money upon railways and public works an average annual sum of £2,000,000 a year for some years, and in addition to that the Indian government have guaranteed £5 per cent. upon nearly £40,000,000 of railway capital. I should have no objection myself to increase the number of those guarantees, but this does not depend upon the will of the Government. The state of the money market at present renders it impossible to do so; for we could not throw fresh guarantee securities into the market without depreciating those in the market already. When, however, the great railways now in progress in India are completed, the great lines of transit communication through India will to a great extent supply the deficiency now so much felt. As far, however, as the roads were concerned, that was a matter more of local concern than of arrangement in this country.

In reply to a question from Viscount Duncan—

*Lord Stanley* said that the instructions which the home Government had sent out would enable the authorities there to improve the land tenure, and in some cases to create a species of freehold.

*Sir G. Ogilvy*—Then, supposing a man builds a factory, or establishes a farm, there is no chance of his being dispossessed?

*Lord Stanley*—Just so. This instruction will meet your views exactly. Sir G. Ogilvy said that an association, which he mentioned,

intended to distribute prizes among the most successful growers of flax in India, and he inquired of the noble lord whether the Government could assist them in that respect?

*Lord Stanley* replied that there was no objection in principle to the distribution of prizes for that purpose, but he thought the growth of flax in India would be much more influenced by the price the producers could obtain for their flax than by any premiums for its successful cultivation. The Government could not encourage the natives to invest their money or labor in the cultivation of an article unless there was a prospect of a steady demand for that article for the future.

Some further conversation took place, in which it was stated by several of the manufacturers present, that at this moment it was impossible to obtain a sufficient supply of the raw material, and that some of the mills were actually standing still in consequence.

*Lord Stanley* said that the subject was one of great importance to the country, and that they might depend upon it would have the closest attention of the Government.—*Home News.*

In connection with this question, and still relating to the Punjab flax produce of 1856, I shall make no apology for here introducing a brief correspondence that took place, in April of this year, at the very time too that the Flax Association, entered on at Dundee under such apparently favorable auspices, was *in articulo mortis*, between Lord Duncan, one of the Members for the county of Forfar, and Sir John Lawrence:—

*15, Hill Street, London, W.,*
*April* 15, 1859.

MY DEAR SIR JOHN.—In consequence of the conversations I have had with you, I beg to call your attention to the subject of "the possibility of growing flax in India to supply the existing deficiency in our home markets."

The deficiency in the supply of flax from Russia and the other producing countries in Europe in the present year is unusually great, and, as I learn from the information furnished to me by parties well acquainted with the subject, many of these countries on which we depend for our supply of flax are themselves annually becoming larger consumers of the raw material. The rapidly increasing manufacturing power employed in our linen trade, as evinced by the commercial circulars which I enclose, must necessarily lead to the consumption of

much larger quantities of flax in this country than used formerly to be the case.

Under these circumstances, the eyes of many gentlemen interested in the linen trade in Forfarshire, in the north of England, in Yorkshire, in London, aud in other places, have been lately turned with much interest to the question of the possibility of procuring a supply of flax from India.

From your great knowledge of our East Indian possessions, and particularly of the Punjab, to which attention has been more immediately directed, I should feel greatly obliged to you if you could furnish me with any hints or facts which I could circulate amongst my friends.

DUNCAN.

THE RIGHT HON SIR JOHN LAWRENCE, &C.

---

16, *Montague Square, London,*
*16th April,* 1859.

MY DEAR LORD DUNCAN,—I beg to return the papers received with your note of yesterday. I suggest that the "Flax Supply Association" devote a portion of the money which has been collected by it, to sending out to the Punjab some one well acquainted with the culture and preparation of flax for exportation. Such a person could go out, collect all the information necessary, and return within six months. The cost of such a mission need not exceed from £700 to £800; and if the agent left England early in October, he would have all the fine cold weather in India before him for travelling about and seeing the country The reports of Government officers alone will scarcely satisfy the Association, or the manufacturers and traders interested in the production of flax. These officers have heavy duties which fully occupy their time and attention; and, moreover, cannot well know the precise data which would be required of them. Nevertheless, their great knowledge and personal influence would be very useful to the agent from England, and these would, I am sure, be cheerfully rendered.

Much of the land in the Punjab is, I believe, well suited for the growth of flax; and there is nothing in the landed tenures, nor in the prejudices of the people, to prevent an abundant supply being furnished. On the contrary, the gain to the agriculturists of a certain market for a valuable product would be fully appreciated.

On the other hand, there can be no doubt that the people require some instruction as to the proper mode of cultivation of flax for the English market; and they ought also to obtain some security that the

crops which they raised would find a ready sale at a remunerative price.*
If, then, the Flax Association were satisfied with the report of its agent, I would then recommend that it establish a regular agency in the Punjab, which would manage a small model farm, and thus show the people practically the best mode of cultivating flax. This agency would, with advantage, make advances to a moderate extent for similar cultivation, and buy all the good flax available for exportation. After a few years, when the agriculturists learnt the benefits to be derived from such produce, the system of advances might cease.

If the Flax Association be not inclined to follow the course I have indicated, I suggest that some of the members invite over to Dundee a German, who has lately been employed by Government in the Punjab in various matters connected with the growth of Flax. This gentleman was about to visit England for the recovery of his health; and, at the instance of Mr. D. M'Leod, the Financial Commissioner of the Punjab, I recommended to the Governor-General, just before leaving India, that he should be allowed his full pay for one year, with the view that he might make himself useful in this very way. I think it very probable that the recommendation has been approved; but I will endeavor to obtain certain information on the subject.

Believe me, your's sincerely,
John Lawrence

Viscount Duncan, &c.

---

The Chamber of Commerce of Leeds, though it did not take a very prominent part in the discussion, came to similar resolutions as the Chamber of Dundee, as to the great importance of the subject, and it was placed beyond a doubt by the deliberations of these important bodies, that the Punjab could produce merchantable flax, that the manufacturers of England, Ireland, and Scotland, were ready and anxious to purchase, and that if proper measures were adopted, the cultivation of flax, as a staple in the Punjab, would be placed on a sound footing, to the great advantage of the Government, who must benefit by improved cultivation, of the

* The cultivators have been assured over and over again that there is a demand, and that a liberal price will be given to them for any quantity of *flax stem* they may produce, thus relieving them from the more complicated process of retting and scutching.—H. C.

Zemindars who would produce the flax, the local commercial agents who would have to purchase and export, and the consumer who is so much in want of the raw material. The Government of the Punjab, as such, appears, however, to deserve very little credit for what has been done subsequent to the year 1855, when its action was, certainly, first-rate; and had it not been for the semi-official countenance of Mr. D. F. McLeod, the Financial Commissioner of the Punjab, and the enlightened support *he* afforded to Major Clarke and to Mr. Steiner, in their subsequent very limited operations, together with the new life infused into the whole question by the reports from England, the whole affair would have fallen to the ground. But for the opportune despatch to England of the fibre prepared in the district of Goojranwala, and singularly enough ignored by the Government in its report, the cultivation of flax in the Punjab would have been, indeed, at the present moment, a mere episode in the history of its productions.

To proceed with my brief history. A small quantity of fibre was again produced in the Kangra and Goojranwala districts, in 1856-57, and was forwarded by Major Clarke and Mr. McLeod to Kurachee for despatch to England somewhere in November of the year 1857. Some fatality seems again to have attended the shipping of this invoice from Kurachee, but where the fault lies I do not know; suffice it that it reached Dundee some time in May of this year (1859), and that its qualities were discussed at a meeting of the Chamber of Commerce held in June, of which the following is a brief report:—

DUNDEE CHAMBER OF COMMERCE.

A quarterly general meeting of the members of this body was held on Wednesday—*Mr. Fleming, President of the Chamber*, presiding.

FLAX SUPPLIES FROM INDIA.

*The Chairman* said, the next business for the consideration of the meeting was a letter which had been received, along with the specimen

of flax from India, now submitted to the inspection of the Chamber, and part of which Mr. O. G. Miller had been kind enough to prepare.

*The Secretary* then read a letter from D. F. M'Leod, Esq., Financial Commissioner at Lahore, respecting the specimen of flax, and also portions of a letter from Lieut-Colonel Clarke, late Deputy-Commissioner at Goojranwala, showing that the first specimen of flax sent to Europe had been grown under his own and Mr. M'Leod's superintendence.

*The Chairman*—I suppose you have all, gentlemen, had an opportunity of examining the very excellent samples of flax which have been sent by Mr. M'Leod. I would propose that, in the meantime, at all events, we should give a vote of thanks to Mr. M'Leod for his great exertions in encouraging the growth of flax in India, and for his attention in sending the present samples to the Chamber of Commerce. (Hear, hear.) I would suggest also, that our Secretary, Mr. Sturrock, should have the whole quantity prepared, and the results made known to a future meeting, to be called for that purpose. (Applause.)

*Mr O. G. Miller*—I cordially second Mr. Fleming's motion to give a vote of thanks to Mr. M'Leod, and I am certain it will be highly agreeable to everybody who has noticed the great exertions he has made from the commencement when the subject of flax from India was first taken up. By the minutes it will be seen that the Directors have already passed a vote of thanks to Colonel Clarke for his exertions, and Mr. M'Leod, at the same time, has been untiring in his efforts to send samples to this country. He was the first to do so; and we are glad to see that the samples sent from time to time have always been steadily improving, and this specimen now before us is by far the best in quality of any we have hitherto seen. It is quite right that we should make a thorough test of the whole which has been sent; but in the meantime I may mention that I have tested a very small portion of it, and that the results are very satisfactory. After heckling, the yield is 55 lbs. per cwt., and the heckling waste only 4 lbs. per cwt. The lint is quite well adapted for 2¾ lbs or 22 lea yarn—(hear, hear)—and the tow of it overhead would all go into 3¼ lb. or 14 lea; and in wet spinning, I have no doubt whatever the lint will do for 29 lea yarn, and the tow for 26 to 18 lea. The flax is very similar in quality to the Riga mark WPHD, is of fine colour, very strong, and the value of such flax, as the market presently rules, would be about £55. The colour of the flax is, as you see, white and yellow, and would be very suitable for some of our textile fabrics. There is a vegetable sap and a cleanness about this flax which the specimens of flax formerly sent by Colonel Burnett did not possess. Altogether, such a sample of flax as this from

India is very satisfactory; and if* we could only get six or eight hundred tons of it at present, that would be a result equally satisfactory. (Hear, hear.)

*Mr. Neish* inquired whether Mr. Miller had not selected the best specimen of the samples for his operation?

*Mr. Miller* replied that he and the Secretary had selected what they considered a fair ordinary sample of the whole quantity.

The motion of the Chairman, giving a vote of thanks to Mr. M'Leod, was then most cordially and unanimously agreed to, and the Secretary was instructed to get the remaining portion of the sample properly prepared, and to report thereon to a future meeting.

At the conclusion of the season of 1857, Mr. Steiner, to whose exertions so much is due, was informed, by the orders of the Chief-Commissioner, that his functions had ceased. He obtained, some months after, other employment, but still felt so confident of the capabilities of the Punjab, for the production of good flax, that he employed a servant of his own to collect stem, and prepare fibre, during the season of 1857-58 in the district of Seealkote, the whole of which has found its way, through my firm at this place, to Calcutta, and been so much approved of, by the purchasers, that, notwithstanding the enormous charges for carriage, they have expressed their anxiety to obtain any reasonable quantity, *and have given orders to that effect.*

Encouraged by the accounts my firm received from certain quarters as to the existence of a market nearer at hand than Dundee or Belfast, they did not hesitate in making known to the Financial Commissioner of the Punjab their readiness to purchase all flax of a merchantable character that might be raised in the country during the season 1858-59. Mr. McLeod was so good as not only to issue circulars to district officers, intimating his readiness to purchase, but also to publish our letter to him in the local prints, and we have every reason to believe that it was such intimation that

* I venture to assure Mr. Miller that if he or any other manufacturer will send *an order* for 500 tons of flax his *if* will be reduced to a certainty.—H. C.

induced Mr. Prinsep to take up the question, and induce the ryots of the district of Seealkote to cultivate what they did.

It is, therefore, established, beyond a doubt, that the soil of the Punjab, and its climate, are suited to the cultivation of flax; that the country seed is suitable to the production of long fibre, if properly treated. It is most satisfactorily proved, from the extracts, given above, that this flax is not only saleable in Great Britain and Ireland but saleable at what appears to be a highly remunerative rate, and that if the local Government, whose late head declared that new staples are much required, would exert itself with vigor in promoting the cultivation, by bringing the influence of its district Officers to bear on the action of the Zemindars, something effectual will be achieved, notwithstanding the difficulties of export, which are certainly considerable.

The notion that seems to be entertained in England about the cultivation of waste lands, and the formation of a Company for doing this, is absurd. Mr. McLeod has clearly pointed out, in a letter to the press, that there are, comparatively, no waste lands available for such a purpose, and that none will be available until the Baree Doab Canal affords irrigation to the centre of the Doab, where cultivation is now so very backward for want of *good* water. All that is required is, that either the Government itself, or capitalists seeking a new outlet for their unemployed wealth, should induce the holders of suitable land to undertake the cultivation, by making them small advances for the first two or three seasons. On no other condition are they likely to do so, until they clearly see the advantages of the crop, and if those interested are really anxious to secure an article promising such a favorable return, this is the only plan by which they can attain their object. I dont *know* what the probable outturn of 1858-59, the whole of which has been taken up by my Umritsur firm, and sold beforehand chiefly in Calcutta, may be, but I am afraid, from all I can learn, that it will be

so small as to be hardly worth mention, on account of the immense quantity of rain that fell in the district in the spring, which threatening great damage to their staple crops, the Zemindars who *had* cultivated flax allowed it to rot on the ground. The season 1859-60 is already drawing on so rapidly, that, unless measures are speedily taken for the *next* season, flax cultivation must, notwithstanding all the advantages it holds out, die out in the Punjab of sheer inanition, imputable, partly to the want of perseverance on the part of the local Government, and greatly to the want of enterprize on the part of the manufacturers who represent themselves so much in want of material to keep their mills in full work.

In a new country like the Punjab, where the Sirkar has been, and continues to be, everything, where a rood of land *may not be purchased by Europeans*, at least without Government interference and sanction, (that is until the new order of things promised by Lord Stanley be brought into operation.) and that after unheard of delays,—the Government *must* take some sort of lead. Without that, the agriculturists are careless; with it, as in 1854-55, they are willing to do any thing they are bidden, and they *must* be bidden even for their best interests; or every experiment *must* fall to the ground. I only hope I may not have to record the entire failure of the flax experiment, and would seriously commend its consideration to the Government, now that a little breathing time is afforded, as a substantial means of proving, to the English public, that there is *some* desire, *some anxiety*, to improve the condition of the people by the introduction of new staples. With silk and flax the Punjab might *almost* in ten years, become a flourishing country, at present *it is verging on the brink of agricultural bankruptcy.** Wheat, that is selling at Kurachee

* In proof of what I venture to assert above, I appeal to the many instances in which it has been found necessary to revise the settlement, from new arrangements pressing so hard on the Zemindars that they could not pay their assessment.

at 15 and 16 seers per Rupee, is glutting the Punjab markets at a maund and a half for the same price; and the present season has, I am told, been so favorable, that the cultivator will be reduced to the greatest difficulties to obtain a sale for his produce *so as to enable him to pay his revenue*;* and this state of affairs is undoubtedly owing, in some measure, to the short-sightedness of the Government in matters of this kind.

In the present year the subject of flax cultivation in India generally came before the Agri-Horticultural Society of India in connection with the Dundee proceedings, a Special Committee was appointed to consider it, and a report prepared which will, as a matter of course, be republished in the current year's report of proceedings. I merely allude to it, to show how general has been the attention bestowed on this highly important question. I may here say also that much information, all carefully condensed in Dr. Royle's Indian fibres, will be found in the early numbers of the Society's *Journal*.

I ventured, in *April* of this year, to address the Secretary of the Agri-Horticultural Society of India, on the subject of the restricted operations of my firm for this season. The note was published in the report of the proceedings of the Society at their general monthly meeting of the 20th April. As it is short, I venture to reproduce it here, as containing something of a prophecy which was, at the time of writing, in the course of verification:—

*To the* SECRETARY *of the* AGRI-HORTICULTURAL SOCIETY OF INDIA,

SIR,—I have read, with much interest, the report of your Flax Committee presented at the last meeting of the Society, and am happy to learn that something is likely to be done in the way of improving the flax cultivation in India. While, however, the good people of Dundee, and of Leeds, and of Belfast, have been *talking* of the necessity of

* In proof of this, I may mention that the agent of my firm while going round to purchase flax in the Seealkote districts was implored by the poorer Zemindars to purchase their wheat at 5 Rs. per manee, equal to about 70 seers per Rupee!

stirring actively in the matter, and have been soliciting the aid of Government, instead of helping themselves, it may be of some little importance to your Society, to know that my firm are, at the present moment, actively engaged in buying up and preparing such of the flax of the Seealkote and other districts, as has been sown during the past season, almost entirely at our suggestion. I cannot say what the actual outturn may prove,* but it will be considerable, comparatively speaking, and I entertain very little doubt, from the arrangements made, that it will be superior in quantity to any hitherto sent into the market. A large portion is already bespoken. Samples will soon be available, and I will do myself the pleasure of sending some of the first that may come to hand for submission to the members of your Society. I may add that the current season has been most favourable, and that the length of stem is said to be beyond that of all previous years. Mr. McLeod and Mr. Prinsep,† have manifested the greatest desire to promote the operations of my firm.

I remain, &c.,
H. Cope.

Umritsur:
*2nd April*, 1859.

I subsequently forwarded samples of this year's Flax to the Agri-Horticultural Society of India, with a letter of which the following is an extract :—

"I now do myself the pleasure of sending you herewith two samples of the flax now being manufactured by my Umritsur firm, in the district of Seealkote, and shall be obliged by your submitting the same to the next meeting of the Agri-Horticultural Society of India. Although the fibre from the acclimated seed is certainly superior to the other sample, it will prove beyond a doubt that good merchantable flax can be prepared from the country seed plant. I desire to draw the especial attention of yourself and the members of the Society to the *preparation* of this flax, which is carried out entirely by natives instructed by Mr. Laurenz Steiner, late Government Superintendent of the Flax

* This was written before I had become aware of the loss to which the flax crop had been exposed by the anxiety of the Zemindars to save their staple (wheat) from the effects of the heavy rain, most unusual at this season of the year.

† Mr. E. A. Prinsep, Deputy Commissioner of Seealkote, took an especial interest in the flax cultivation of his district in 1858-59. He obtained the sanction of superior authority for the bestowal of prizes on the most successful cultivators, and held a meeting in April at which these were distributed. I hoped to have been able to send the Society an account of these interesting proceedings, but I have not yet been favored with a copy ; should I obtain one in time I will forward it to be added to this paper.

Operations, and who has, I regret to say, been compelled, by the state of his health, to return to Europe, leaving to our care a small staff of well-trained scutchers, whose labors show that natives *can* and *will* prepare flax in a careful and workman-like manner. The outturn will not be large, but sufficient to show what can be done."

This sample was submitted to the meeting of the Society, held on the 15th July, when

*Mr. W. Stalkartt*, a member of the Fibre Committee, submitted the following report on the samples I forwarded:

" *Flax from acclimated seed.*—Is a decided improvement on any flax previously grown in this country on a large scale. It is of good length, and very strong; but a little harsh, and not very well cleaned.

" *Flax from indigenous seed.*—Is also of fair quality, not quite so long and strong as the other, but cleaner, and no- so harsh.

" Both very serviceable articles."

It was *resolved* that a copy of Mr. Stalkartt's opinion be furnished to me. Further, that these samples be forwarded for report and commercial value to the Dundee Chamber of Commerce, who have already reported on Indian grown samples of flax. (See *Journal*, Vol. IX, p. 379, and Vol. X, p. 220.

It may have seemed presumptuous in me to be writing somewhat superciliously of so influential a body as the Chamber of Commerce of Dundee, and of its members, but I regret to say my grounds for doing so were but too well founded, as I have early authentic information that, notwithstanding all that was *said* at the meeting of the Chamber on the 5th January, nothing had been *done*. The Association which the members attempted to organize was pronounced, by one of the chief speakers at the meeting, "to have been a *total failure* for want of sufficient pecuniary support." The trade is in such a state of prostration, says a letter of the 13th April, from one of the principal Members of the Chamber, now before me, that "few have been found willing to risk a present penny for a future pound." On the

other hand, the same letter says that flax fibres are enormously high, and likely to continue so for a long time to come, even although the crop of the present year be an abundant one in all flax-growing countries. "Flax similar to the samples we had from the Punjab, would, at present, fetch £53 to £55 per ton of 20 cwt." [equal to NINETEEN Rupees *per maund.*]

My correspondent continues to say:—

"This being the state of the market, people in the trade are hopeful that a great impetus will be given to flax growing, and that without *their* exertions there will be an increased production in all quarters, and that India will not be behind after what has been shewn can be done there."

Was I far out in saying, that the good people at home were *talking* of what they would do to further flax operations in the Punjab? If they lean on the broken reed of what may be done for them in the Punjab, they may find themselves mistaken.

As some attempts, which I may almost term unfair, have been made, in certain quarters, to deprive me of the small credit I venture to think I deserve, for initiating the question of flax-growing in the Punjab, the Society will perhaps permit the publication of the following communication received by me in reply to a letter I addressed to Mr. McLeod on the subject :—

To HENRY COPE, ESQ.,
*Umritsur.*

Revenue Flax. SIR,—In reply to your letter of yesterday's date, I have the honor to state, that you are, in my opinion, without doubt, entitled to the credit of having, as Secretary to the Agricultural and Horticultural Society of the Punjab, first initiated, as well as taken the principal part in promoting the experiments, which have ultimately proved that the Punjab is well adapted for producing Flax fibre, suited to the wants of British manufacturers, and which have directed

their attention to this province, and excited their interest in a remarkable degree.

2. The immediate credit of having produced the Flax which has decided the question, is due mainly to Colonel Clarke, who, as Deputy-Commissioner of Goojranwalla, applied for sanction to make advances to cultivators, on certain conditions; and by his judgment, energy and agricultural knowledge, and the confidence placed in him by the cultivators, was enabled to persuade them to accept of and fulfil the terms proposed: as also, to Mr. Steiner, without whose skilful guidance and supervision, it is quite certain, that the successful results which have thus far been attained, could never have been secured.

3. It is, however, at the same time, quite certain, that but for your previous exertions, neither of the above gentlemen would have been in a position to effect, or even to undertake, what they have effected, nor do I believe, that but for your advocacy, as Secretary of the Society, and the financial success of your previous operations, the Goojranwala experiment would have been acceded to by Government.

4. It was you, who first moved the Society, and through it the Government, to enter upon the experiment of extending and improving the cultivation of linseed and flax; it was you, who discovered Mr. Steiner, secured his nomination as Superintendent, and assisted and encouraged him throughout, as he gratefully acknowledges, but for which I am convinced that all our efforts must have been in vain, and it was you, who gratuitously superintended all the arrangements, both for preparing fibre and collecting seed, with such success, that the profits gained by the sale of the latter more than covered all expenses.

5. The opinion which I now express, I have uniformly expressed in all the communications on the subject which have passed from my Office to that of the late Chief-Commissioner, or elsewhere; and that they were shared, to some

extent by him, and accepted by the Supreme Government, would appear from the fact, that a donation of 1,500 Rupees was awarded to you, in recognition of your services, before the results of the dispatch of Goojranwala flax to England had become known to us.

I have, &c.

(Signed,) D. F. McLeod,
*Financial Commissioner.*

Lahore :
*2nd April,* 1859.

---

My firm will probably continue to do all that can be done under the circumstances, but I cannot conceal from myself, that they are disheartening, and that the absence of all co-operation as to funds, which we had good grounds for expecting from Great Britain, may act injuriously on the future prospects of flax cultivation in the Punjab. Time will shew.

*P. S.*—I deem it right to add that, since writing the above, I have received a semi-official announcement that His Honor the Lieut-Governor of the Punjab, had forwarded a recommendation to the Supreme-Government, to the effect that my firm at this place be exempted from the payment of export duty on the Flax they may export to England during the next two years.

The Agri-Horticultural Society of the Punjab, have taken up the subject of flax cultivation. They purchased some eight tons of Riga flax seed, imported in the first instance on his account by Col. Burnett, which if good, should, at the rate of 32 seers per acre, be enough to sow 300 acres of land, and produce, at the lowest calculation, 60 tons of flax, and it is to be hoped that a judicious distribution of this seed will go far to induce the zemindars to cultivate more largely and more willingly than they have hitherto done. The Society have offered to sell me a small quantity, as they consider me most likely from my zeal and experience to thoroughly test and prove the adaptation of our Punjab soil to the growth

of this valuable article, and I need not say that I shall gladly avail myself of the opportunity offered, if the seed should, on arrival, prove not to have lost its vegetative powers, as has so unfortunately been the case with the previous invoices of seed received from England.

I am endeavouring my best to induce the men of Seealkote to cultivate a much greater breadth of land than has been the case during the past season, by arranging for advances on the amount of land sown. Though I regret to say that such is the character of the people that I cannot, as a rule, depend on the fulfilment of their part of the contract that may be entered into, unless the Government officers afford something of a guarantee that the zemindars shall not depart from this agreement. Every thing in the Punjab in matters of land is "Hookim Sirkaree," and without it nothing can be done.

*Second P.S.*—Since writing the above, and with reference to my note at page 126, I have been favored with a copy of the correspondence relating to the "Flax Exhibition at Seealkote, which I am sure will be interesting to the Members of the Agri-Horticultural Society of India. I have therefore the pleasure to forward it for publication. It affords a proof that the Punjab Government are again awakening to the importance of encouraging flax cultivation, and that one of its officers at least has evinced a lively interest on the subject. I trust the action of the local Society may also be useful and calculated to promote the good cause.

CIRCULAR, NO. 53.

*From A. A.* ROBERTS, ESQ.,

*Officiating Financial Commissioner for the Punjab.*

*To the Several Commissioners and Superintendents.*

*Dated Lahore, 14th July,* 1859.

SIR,—I have the honour to annex for the information and guidance of yourself and District Officers, Extract paras. 1, 2, and 4 to 9, from a letter No. 408, dated 3rd June,

Revenue (Flax.)

1859, addressed by the Deputy-Commissioner of Sealkote, Mr. Prinsep, to the Commissioner of the Umritsur Division, containing an interesting account of a flax meeting held at Sealkote on the 14th May last, together with a list of exhibitors who were awarded with prizes on that occasion, and also copy of letter No. 711, dated 24th June, from the Secretary to the Government of the Punjab, conveying the approval and observations of His Honor the Lieutenant-Governor.

2.—I beg to call particular attention to the 2nd para. of Mr. Davies' letter, and request that you and your Deputies—especially those located in districts more peculiarly suited than others for Flax cultivation—will spare no exertions in acting up to the spirit of His Honor's recommendations.

I have the honor, &c.

A. A. ROBERTS,

*Offg. Financial-Commissioner for the Punjab.*

---

*Extract paras. 1, 2, and 4 to 9 of a letter No. 408, dated 3rd June, 1859, from the Deputy-Commissioner of Sealkote, to the Commissioner of the Umritsur Division.*

In continuation of former letters, I beg to report for the information of the Financial Commissioner, that the Flax Meeting, as intended, was duly held on the 14th Instant.

*2nd.*—A large concourse of the agricultural gentry were present on the occasion; each village brought in its own selected bundle of Flax for exhibition. The Tehseeldars, too, came in to support the movement, and took their place in the Durbar, which was held in the Tehseel yard, each sitting in front of their respective constituencies.

*4th.*—From a rough survey I should say that there were at least about eighty exhibitors—each of whom presented his bundle, marked with his name and the estate on which it was grown.

*5th.*—Out of this number, the Committee, consisting of myself, Captain McMahon, and the four Tehseeldars, selected 12 samples as deserving of rewards, divided into three classes for flax grown from English seed, and 3 from country seed.

*6th.*—These specimens were admirable, none measuring less than 3½ feet, while some of the first and second class bundles measured 4¼ feet in length.

*7th.*—Two Flax mills were kept at work during the time of exhibition, so that parties might see the practical advantages to be derived from the sale of this twist, which I showed to many of the principal Chowdrees, who seemed to be agreeably surprised to find such a fine twist elicited from what they had hitherto never regarded as of any value.

8*th*.—Specimens of English linen made from Flax were also cut up in small yard pieces, shewn to the exhibitors, and were given to those who had carried off prizes, and the heads of all successful competitors were further enrobed with flowing turbans, a process which seemed to elicit much mirth and occasion for quiet jesting.

9*th*.—On the whole, the meeting seemed to afford evidence of a new interest that had been awakened, and several of the more notable Chowdrees, who had nothing to shew from their estates this year, gave promise of trying their luck in future years.

*Prizes awarded for best specimens of English and country Flax at the Meeting held at Sealkote on 14th May, 1859.*—

| *Exhibitors.* | *Village.* | *Prize.* | Rs | |
|---|---|---|---|---|
| | **FIRST CLASS.** *English Seed.* | | | |
| Junda, .. .. | Dobeerjee, .. .. | Pair of Bullocks value, .. | 46 | |
| Fuzul Bux, .. | Sookonuhur, .. | ,, ,, .. | 46 | |
| Mooslun Sing, .. | Kheewa, .. .. | ,, ,, .. | 34 | |
| | | | —— | 126 |
| | **SECOND CLASS.** | | | |
| Punjab Sing, .. | Raneke, .. .. | Khes, .. .. | 25 | |
| Junda Sing, .. | Chubleepore, .. | ,, .. . | 20 | |
| Soor Muck Sing,.. | Jauke, .. .. | ,, .. .. | 15 | |
| | | | —— | 60 |
| | **THIRD CLASS.** | | | |
| Rooldo, .. .. | Ada,.. .. .. | Khess,.. .. | 10 | |
| Dia Ram, .. .. | Sookonuhur, .. | ,, .. .. | 10 | |
| Yadgar, .. .. | Kothe Soorasing, .. | ,, . .. | 10 | |
| | | | —— | 30 |
| | *Country Seed.* | | | |
| Fuzeldeen, .. | Sadra Budra, .. | Cash, .. .. | 15 | |
| Surfraz, .. .. | Bheer, .. .. | ,, .. .. | 14 | |
| Shama, .. .. | Oodawar Pundaree, | ,, .. .. | 5 | |
| | | | —— | 34 |
| | | Grand Total,* .. | | 250 |

(Signed,) E. PRINSEP,
*Deputy-Commissioner.*

* Rs. 19-9 for Pugrees, &c., Rs. 269-9 Total.

No. 711.

*From* R. H. DAVIES, ESQ.,

*Secretary to Government, Punjab and its Dependencies,*

*To* THE OFFICIATING FINANCIAL COMMISSIONER FOR THE PUNJAB.

*Dated Lahore, the 24th June, 1859.*

SIR,—In returning the Original enclosures of your letters Nos. 343 and 243, dated respectively 9th and 13th instant, relative to the promotion of Flax cultivation in the Sealkote district, I am to request that you will tender the acknowledgments of His Honor the Lieutenant-Governor to the Deputy-Commissioner for the active part he has taken in the matter.

Revenue Department.

2.—The Lieutenant-Governor hopes that Annual Meetings will be continued, at which prizes will be distributed to the most deserving. In His Honor's opinion, there is no plan likely to be so successful as that adopted by Mr. Prinsep, viz. to assemble the respectable agriculturists of the district, and deal with them directly, distributing prizes not only to the most successful cultivators of Flax, but also conferring some mark of distinction, as for instance a Pugree, to all those who exerted themselves to promote its cultivation.

3.—A copy of this correspondence (or the substance of it) might with advantage be furnished to the Agri-Horticultural Society at Lahore.

I have, &c.,
(Signed) R. H. DAVIES,
*Secretary to the Government, Punjab.*

---

*3rd P. S.*—Since writing the above, I have been favored by Mr. A. H. Blechynden, Secretary of the Agri-Horticultural Society of India, with an extract from the *Dundee Advertiser*, of the 12th August, 1859, from which I learn, with much satisfaction, that the Punjab flax of the season 1857, more particularly alluded to above, in pp. 120—121, has been submitted to the unerring test of a sale by auction at Dundee, and that it realized the average sum of £54-10 per ton, within a fraction of Rs. 20 per maund of 82 lbs ! I give the extract in full, as it will prove a suitable addendum to my attempts

to shew that flax will prove a remunerative crop in the Punjab :

*Flax from India.*

It has always been the common remark that when an emergency—or the probability of one—happens, Englishmen bring active resources into play, and thus get over their difficulties. At present this is strongly exemplified by the young men over the country forming themselves into rifle and artillery corps. Last autumn, when there were great and good reasons for strong measures being adopted, not for the purpose of encouraging our population in arts of war, but to forward our local trade by finding new markets for—the life of the district—Flax, a very considerable stir was make; meetings of the Chamber of Commerce were held; the fibre itself from India was produced at the meetings; resolutions were passed, and the basis of a Flax Supply Association formed; but still, except this, and our taking care to report all the proceedings most fully and carefully, nothing more has been done. No doubt the labours of the Chamber, and the dissemination of information shewing the full capabilities of Upper India as a flax-producing country, has done, and we believe is doing, good; but it is to be regretted that those interested, not solely in the Flax trade, but in the manufacture of all our textile fabrics, did not come forward zealously and carry out the original intention of the Chamber of Commerce, viz., the formation of an Association for promoting the growth of flax in India. In the Annual Report of the Chamber, it was stated, in reference to this subject, that "the demand for increased supplies of flax is not temporary, but permanent; and there is, therefore, a wide field open, which it only requires private enterprise to occupy." This is quite true; and it is not our belief that trade is to be carried on by associations; still there is the "Cotton Supply Association," encouraged by all the Manchester spinners; besides, as was remarked by us very lately on this subject, what "is a body of individuals associated, and all having a personal interest in the matter, but private enterprise in an organised form? Should an association be properly established and carried on prudently, an immediate impetus may be given to the movement, and much more can be done by it within a like period than by firms entering upon it as a new trade, and as a speculation only."

It is gratifying, however, to be able to report that something is being done in this matter. At a late meeting of the Chamber of Commerce a sample of flax was produced, which had been sent home by the Commissioner at Lahore. It was then considered the finest

that had been seen; and Mr. Miller, the ex-President, and who had been the principal mover as to the Flax Supply Association, stated that "the value of such Flax, as the market presently rules, would be about £55." Since, then, the small parcel imported has been sent here from London, and was put up for sale by auction last Tuesday. From being the first Flax from India ever exposed here, great interest was manifested in examining it, and the price given for it was at the rate of £54-10*s*. per ton. Had there been a large parcel it is not probable such a high figure would have been reached; but there is no doubt the quality, as testified by thorough practical parties, was excellent; and such Flax will not only always come to a ready market, but even, when the general prices are low, will fetch a good price, such as, there is no doubt, from the information of Colonel Burnett and others, will pay the grower very handsomely. The expenses on this lot must have been very heavy, both in India, and the charges for warehousing in London, but this will soon be altered. The Indus Flotilla Company have already sent out a number of steamboats and barges, and when the Scinde Railway, now far advanced, is also in operation, produce of all kinds will be brought from Upper India to the shipping port of Kurachee at a very diminished rate, and, in addition, days only will be consumed on the route in place of weeks, as at present.

It has been undoubtedly proved that Flax can be grown in Upper India; and, if not before, it has also been now proved that such a price can be got for it in Dundee as will pay the grower. Under these circumstances, and more so from the communications steadily improving, we have no doubt that eventually—it may be years—the trade will have a good supply of Flax from India. In every community there are parties—croakers they should be named—who are apt to give everything new the cold shoulder. It is very probable, it may be said, that it is impossible Flax can be raised in India with profit, the charges are so heavy; it will not come home sound, and many more assertions of a like nature. We would only remind those individuals that the same was said of jute, and now the present consumption here is from thirty to forty thousand tons a-year. Let the trade, therefore, take encouragement even from this small beginning, and if they are persevering and determined in their efforts to get flax from India, no doubt it will make its appearance.

There is also a point well worthy of consideration relative to Indian flax. The distance is so great that it will not pay to send it home ill cleaned and of bad quality. It is notorious that a very large quantity of the flax brought from Russia and Prussia for a considerable time

past is merely flax in name, some of it scarcely fit for tow, and which should have been selected as codilla only. Great efforts were made some time ago by the Chamber of Commerce to get alterations made in the "brack" abroad, but which, from experience since, has proved quite futile, and literally there has been a change, not in words, but only in another variety of letters. Let an ample supply of real good clean flax be brought from India or any other market, and this will produce greater changes than any "brack" whatever.

It is to be hoped that the trade has now passed through a late hard trial; prices are now considerably lower, and it is reported that the prospects for the growing flax are good. It is very difficult, however, to procure correct accounts, those from the Continent are various, and some not even favourable. The following is a late report from Ireland:—

"The Irish flax crop has been falling off more or less in extent every year since 1853. That season there were 175,000 acres under flax crop, while last year the entire breadth little exceeded one-half of that acreage. The Registrar-General has not yet issued his annual returns for this year, but it may be safely predicated that the extent of flax culture will be found much under the lowest of the last ten years. And besides this narrowed area, the yield, we regret to say, promises poorly, and in some cases is not likely to produce any thing like an average. Down, Armagh, and Tyrone, the chief districts for the finer descriptions of fibre, all report short and stunted crops. The strong and continued droughts of April and May prevented many farmers, who had intended to grow flax from carrying out their intentions, while numbers of those who did sow it, found the young plant looking so ill during the dry weather of June, that they ploughed up the land again, and put early turnips or late potatoes in its place.

"It is thus evident that the spinners of Ireland cannot depend largely on the produce of the home crop for their supplies, as even were it to turn out a full average, the requisite supply would fall immensely short of meeting the demands of the trade. An addition is needed somehow."

The conclusion of the whole matter is, let not the trade be entirely dependent on Russia, Prussia, or Ireland; look for new markets, and when one is pointed out as being most suitable, give it trial after trial, and after a time these efforts will be rewarded by the wished for object being gained.

The people of Dundee, have, I am told, intimated to Mr. A. A. Roberts, the Officiating Financial Commissioner of the

Punjab, that parties are now open to offers for quantities of hemp or flax of the quality above reported on, if properly retted and prepared, free on board at Kurachee. I can only repeat that, as far as I am concerned, I shall not act on such vague assurances. If the people of Dundee really want our flax, let them send orders for it in the usual way, and these orders shall be attended to, but I would otherwise not put a maund on board at Kurachee, so long as there is a liberal market open in India for as much as the next year at least is likely to produce.

Hemp is included in the intimation conveyed to Mr. Roberts. This relates to some specimens of Himalayan hemp sent home by Mr. McLeod at the same time with the last consignment of flax, and supposed at Lahore to be a species of the Rheea fibre (apparently the same as the *Urtica nivea*, or China grass of commerce.) I say *supposed to be*, because I have every reason to believe that it is nothing but the sunn of the Kangra district, known in that quarter by the name of hemp; it is brought from Kooloo, and I have sent a sample to the Agri-Horticultural Society of India for examination, especially with a reference to its enormous strength. Fibre-producing nettles no doubt abound in the Himalayas, but they require a different treatment to obtain the fibre. What I believe to be sunn was valued at Dundee at £ 30 per ton, and said to be equal to the best St. Petersburgh hemp.

I may add, with the view of making this paper as complete as circumstances will admit of, that my firm has taken steps for extending the cultivation of flax into the district of Umritsur—namely 15½ acres in the Naroowal pergunnah of the Umritsur district, and 4½ in the immediate vicinity of Umritsur. Of the former, 12 acres are *chabee* land (that is irrigated by wells) and 3½ *sailabee*, or land occasionally flooded by the river, and always sufficiently moist to require no artificial irrigation—though not at present, on any

extensive scale: and finally, that the Right Honorable the Governor-General of India in Council, has conceded to us the exclusive privilege, for two years, of exporting flax grown in the Punjab to England, *viâ* Kurachee, free of duty; a concession which we may reasonably consider in the light of some recognition of the exertions we have made to extend flax cultivation in this Province. I trust we may be in a condition to avail ourselves largely of this condition during the two coming years, and that by that time Flax may be considered a staple produce of the Punjab.

---

*The Green Dye of China and Green Dyeing of the Chinese; by Monsieur* NATALIS RONDOT, *with sundry papers on the same subject by other authors: Translated from the French by* HENRY COPE, Esq., *of Umritsur.*

*Continued from* VOL. X, PART III, *p.* 338.

PART 2ND.

### OF CHINESE GREEN DYES OTHER THAN THE LO-KAO.

Dyeing in green is an old practice in China. In the 12th century before Christ one of the carriages of the Empress was trimmed with silks dyed with dark green (greenish blue,) and one of the chariots of the Emperor was painted of the color of the *tsao* plant (light green.) The *Tcheou-li* from which I borrow these facts (Book xxvii) was edited by Prince Tcheou-Koung, brother of the Emperor Won-wang, and Regent during the minority of his nephew Tching-wang. He flourished at the commencement of the 11th century before Christ. The *Chi-king* is a collection, prepared by Confucius, of the national songs before the 6th century before Christ; the author of one of these songs talks of the green robe of a princess of Weï.

Several processes for dyeing in green are known in China; those most extensively adopted depend on a union of blue and yellow. The Chinese assert that certain plants yield of

themselves a green color; however this may be, one of the *lo-chous* has this property, and it will, I trust, not be long before it is proved.

---

## I.

### Dyeing Green by means of Blue and Yellow.

I often frequented during the years 1844 and 1845, the dyeries of Canton, and I learnt in five of the most extensive, and especially those of Kong-tching and of Hon-ching, manufacfacturers of silks, how they dye silk, cotton, and the thread of the *Urtica nivea*. I saw silk and cotton dyed at Ningpo, at Ting-haee, Tchin-haee, at Amoy, at Tchang-tcheoufou, and at Shanghai. What I now state is an abstract of notes taken down at the very time, not only at the dictation, but frequently after following the dyer at his work and causing him to go over it again.

The process by which at Canton the best fixed green is obtained, is as follows:—a foundation of yellow is given by a bath of *hoang-teng* without mordant; passed to blue, through a bath of *lan*, also without any mordant; then dried in the sun. The cost of this dye is 4 silver mace per catty of silk, that is about 5 francs the kilogramme, or 5½ mace in sepecs, for a piece of 10 tchang.*

The *hoang-tchi* is used in preference with the *lan* in dying cotton, Tchu-yune also recommends it for silk.

The color named the *thsao-téou-lo*, or green, resembling the herbaceous dolichos, is obtained with the *hoang-pe*, and the blue of the *hien-lan*, which seems to be a variety of *Polygonum Chinense*. For the mandarin green, or *Kouan-lo-se*, the *hoai* and the *lan* are in use.

For deep green the blue dye-stuffs are the *tien-tsing* and the *thou-tsing*, and the *lan* for the light green.

* A mace or mess is a string of sapecs worth about 45 centimes, and a *tchang* is a measure of 10 *tchi* or feet.

The yellow stuffs are, according to their intensity, the *hoang-teng*, the *hoang-tchi*, the *houai-hoa*, the *hoang-pe*, the *ti-hoang*, and the *Kiang-hoang*.

The three first are most generally used in preparing green dyes. These six substances are not used indiscriminately; each have a peculiar property, either as to shade, fastness, or brilliancy; one unites best with the *lan*, another with the *tien*.

Some very curious species of tapestry, even thick and massive, named Mao-tan, are made at Hang-cheou-fou, and at Ningpo. It generally represents curiously shaped birds. The weft is of stout cotton; the web sometimes coarse wool, or goat's hair, sometime cow's, dog's, or deer's hair. A carpet of this kind of wool and hair of eight or nine colors, 2 metres 5 centimetres long, by 1 metre 46 centimetres broad, weighing three kilogrammes, 280 grammes, with five storks, or five cranes, flying in the midst of clouds, cost 16 francs at Ningpo, in 1845.

I have seen wool dyed checkered at Ningpo by a maker of these carpets, named Sang-sim. To obtain this green, he dipped first in a bath of *tien-tsing*, and then in a bath of *hooai-hoa* with alum.

When the carpet is finished, a greater degree of brilliancy is imparted, by giving new colors to the surface with a brush, and the very coarse figures are somewhat touched up. A clever painter gains in this sort of work 2 francs and 40 centimes a day. The green used for this brush coloring and painting is extracted direct from a plant named *koang-ching*: it costs 80 or 100 sapecs the catty, or about 65 centimes the kilogramme. I did not succeed in obtaining any of the yellow dye stuffs.

---

## II.

### Of the Yellow Dye Stuffs.

1.—*The Hoang-ten.*

The *hoang-ten* (yellow Indian reed) is the root, or the stem of a shrub growing in the province of Koang-si, and which is said to resemble the Indian reed. The dyers purchase under that name, at the rate of from 6 to 15 dollars per picul (in 1845) a kind of small twisted vine piece of from 10 to 15 millimetres in diameter, of a bitter taste, of which the thin-shrivelled back is of reddish brown. Inwardly the texture is laminated, and of a fine yellow color. The bath is prepared by leaving the *hoang-ten* to macerate in cold water for three or four days. The cloth is dipped without the aid of any mordant.

My venerable friend Don Inigo de Azaola, of Manilla, thought the *hoang-ten* might be the root of the shrub known to the Tagals by the name of *suma* and *lactang*, the *Menispernum cocculus*, L. Is it not more likely to be the *Fibraurea tinctoria*, Lour, (*Menispernum tinctorium*, Sprengel; *Coeculus fibraurea*, Decand.)? Loureiro (Vol. II, p. 627,) gives a description of the stems of this plant, that corresponds with what I know of the *hoang-ten*. He adds, that the stems yield, by boiling, a yellow dye, not very brilliant, but fast. On the other, I find in the *Account of China:* (Vol. III, p. 372,) that the roots of *Menispernum tinctorium* are used to dye yellow. It is, according to Loureiro, the *tien-sien-tan* of the Chinese and *cay-vang-dang* of the Cochin-Chinese. It is likewise given under that name, and that of *Cocculus fibraurea*, in the *Hortus floridus Coccininæ*. I observe that the Chinese characters we render *hoang-ten*, are pronounced *vang-dang* in Cochin-Chinese, and have the same signification.

2.—*The Hoang-tchi.*

The *tchi*, or *hoang-tchi*, is the fruit of a *Gardenia*, a rubiaceous plant. There are three species: the first the *tchi-tse*,

an elongated fruit; second, the *chan-tchi*, an oval-shaped fruit, not so large as the former; the third, the name of which I do not know, the fruit is smaller and nearly round. There are discrepancies in the botanical descriptions. If we confide in those of Loureiro and Osbeck, the *tchi-tse*, is the *Gardenia grandiflora*, and the *tchin-tchi*, the *G. florida*, L. De Candolle, on the other hand, says, the *tchi-tse* is the *G. Florida*, and *chan-tchi*, *G. radicans*, Thunb,

Those who have noticed the *tchi*, and by *tchi* I mean the fruits that bear that name, have not mentioned the particular kind in their view, we are therefore obliged to attribute to two or three species, properties that they can only claim in different degrees.

Before noticing facts, hitherto almost forgotten, it is necessary, in order easily to obtain these plants or fruits, to remember the names by which they are known.

*Tchi* and *hoang-tchi*, are applied to two or three species. Cleyer and Kæmpfer mention the *tchi;* the Chinese dyers made these fruits known to the Commercial Delegates in China, under the sole name of *hoang-tchi*, but the Canton fruits were of the elongated kind. At Ningpo and Shanghai they were ovoïd, and not so large. It is these last that Mons. de Montigny and Father Aymeri have recently sent to France, under the name of *hoang-tchi-tse*. The elongated kind has been received in Germany and in Holland under the name of *Wongsky*, *wongshy*, *wongs-chy* (*hoang-tchi*); the two kinds possessed by Mr. Hanbury, are the *tchi-tse* (elongated) and the *tchan-tsi* (ovoïd).

---

*Gardenia radicans*, Thunb.

*Tchi-tse.*—Mr. C. Shaw, *Chinese Repository*, Vol. XVIII, p. 15.

*Chan-tchi.*—Messrs. Hoffman and Schultes.

*Choui-tchi-hoa*, Messrs. Hoffman and Schultes.

*Tsio-che-hoa.*—Dr. W. Williams.

The East India Company sent to the Great Exhibition of 1851, some Chinese fruits put down in the *Official Catalogue* as produced by *Gardenia radicans* (Vol. III, p. 1420.) It is stated in the *Catalogue*, that these fruits, boiled with glue, afford a yellow paint for furniture.

---

*Gardenia florida.*, L.

*Tchi-tse*—Loureiro; Messrs. Hoffman and Schultes.

*Hoang-tchi-tse.*—Messrs. Hoffman and Schultes.

*Hoang-tchi.*—Cunningham, Osbeck, Dr. Bridgman.

*Pé-yu-hoa.*—Messrs. Hoffman and Schultes; Mons. Decaisne, *Kwa-wi*, according to the Japanese flora.

*Pè-tchen-hoa.*—Drs. Williams and Bridgman.

*Pak-sema-hwa.*—Mr. Fortune, *Residence among the Chinese*, p. 206. This name is altered from *Pe-tchen-hoa.*

---

*Gardenia grandiflora*, Lour:—

*Hoang-tchi (Wongsky)* Dr. Jissen.

It follows from what is said above, that it is not precisely known to which species of *Gardenia* belong the fruits named *hoang-tchi*. The three kinds used above are not used promiscuously in China for the purposes of dyeing; the most elongated fruit appears the most abundant, and most commonly used, but the ovoïd and round are considered the best.

It is evident that the *hoang-tchi* is neither a gentian nor a scitamineous plant, as asserted by several Germans of science; and, in the present state of the question, we may believe that the *tchi-tse* is the *Gardenia grandiflora;* the *chan-tchi*, the *Gardenia florida;* and the third species, either *Gardenia florida* or *radicans*.

According to James Cunningham, the *hoang-tchi* gives a scarlet dye; this assertion has been repeated by Plukenett, Loureiro, and Grosier.

Kong-tching and Tchu-yune have dyed silk and cotton yellow in Canton before me. It yields a yellow dye, highly valued in China, the brilliancy and fastness of which were greatly extolled at Canton and Ningpo. A dyer at Shanghai told me that they are employed at Peking for the yellow dresses of the Emperor and of his family, as they are a little more costly than the *hoai-hoa* and the *Curcuma*, the latter articles are generally preferred in the manufactories. The *hoang-tchi* is, however, somewhat commonly used for greens in cotton, and also giving in certain cases a foundation of yellow to silk stuffs. To grass cloths, and to cotton, which are to be dyed scarlet, &c., with safflower, it increases the intensity and fastness of the color.

This scarlet attracted the attention of Bancroft, who obtained several yards of cotton cloth dyed in this way from Sir George Staunton. He attributed it, on the authority of James Cunningham, to the *hoang-tchi* alone. This fine color, tolerably fast, when exposed to the air and the sun, is equal to that of cochineal, and appeared to have a resinous character, and to be obtained without mordant. Bancroft was surprised to find that it resisted the most powerful acid much more effectually than some colors considered more durable. Concentrated sulphuric acid hardly affects this color, but slightly; strong chlorhydric acid changes it to orange, azotic acid to yellow.

Cunningham had observed, as I have remarked above, the use of *umki* in China for scarlet, the *umki* being the *hoang-tchi*, the difference arising out of the Cantonese dialect, and the ancient mode of writing Chinese names. Fig. 4, of the plant, No. 448, of the *Amaltheum*, and the description given by Osbeck, leave no doubt on this subject: the *umki* of Cunningham is the *chan-tchi* with ovoïd fruits, the *Gardenia florida*, L.

Loureiro and Monseigneur Tabard state on the other hand that the pulp of the fresh fruits of *Gardenia grandiflora* dyes

silk a fine red, and that the fruit of *G. florida*, possesses the same property, but as regards the latter species, Loureiro, like those who mention the scarlet it produces, writes, on the authority of Cunningham. Mr. Fortune asserts that the Chinese use the fruit of *Gardenia radicans*, for dyeing.

In Japan, according to Thunberg, in India, says Roxburgh, the fruit of *G. florida* is used to dye yellow. Burnett asserts the same in regard to China. Kong-tching shewed me that the *hoang-tchi* affected safflower so in the same way as *hoang-ten*, another yellow coloring matter, in dyeing scarlet with safflower and red with sappan, or as the *ou-pei-tse* in dyeing scarlet with cochineal. "Its effect," said he, "is that of a mordant; it fortifies the color."*

May not the assertions of Cunningham and Loureiro be founded on the important part these fruits take in the dyeing of scarlet.

In 1845, the dyers of Canton bought the *hoang-tchi* at 10 or 12 dollars per picul (about 1 franc per kilogramme.)

The shrub abounds in the neighbourhood of that town and of Ningpo. The fruits and the seeds which I brought in 1846, were obtained, some in the garden of Fah-ti, near Canton, others from Ningpo and Teng-haee. Mons. E. Tastet, in March, 1857, presented to the Chamber of Commerce of Lyons some fruit that he obtained from Father P. Aymeri, a Lazarist missionary, then at Shanghai.

The *hoang-tchi* has already been the subject of interesting experiments by German chemists. The first and most complete were made in 1849, by Professor W. Stein, of Dresden; the result is described in the *Chemico-pharmaceutical Journal.*

The more recent researches of M. Von Orth has been described in the *Neues repertorium fur Pharmacie*, and Professor F. Rochleder, of Prague, has published in the same

* The same is the case with *Loodhur* in Upper India. It yields a yellow, but is used as a mordant for Madder — H. C.

collection a note on the *hoang-tchi.* I ought also to allude to the experiments of Dr. Th. Martius, of Erlangen.

I cannot pass in correct review all these analyses and notices, but I will point out the principal facts elicited. They are, first, that those fruits contain a great quantity of matter resembling pectin; second, a substance analogous to *rubichlorsaure,* which decomposes when heated with chloro-hydric acid, giving hitherto a green powder insoluble in water; third, an astringent matter assuming a green color under the action of salts of iron; fourthly, a body imparting a yellow dye, which seems to have some connection with alzarine. Dr. Th. Martius has, moreover, found mannite in it.

3.—*The hoang-tchi.*

Another yellow dye bears the name of *hoang-tchi,* but the character *tchi* is written differently. It is the yellow coloring principle of the flower of *Carthamus tinctorius,* L., the *houng-hoa,* or *hoang-lan-hoa.* This plant, which has been imported from Eastern Asia [? Eastern India, Tr.] into China under this term by General Tchang-kien, is cultivated in the Province of Sse-tchouen, Yun-nan, Ho-nan, Chensi, and Kiang-si. The flowers are placed in a bag of cloth, strongly pressed, being first dipped in pure water, and then in the water of *sourrin*; the bag is wrung several times, in order to extract all the yellow juice. This done, the flowers, that now contain only the red color, are damped with a watery solution of the ashes of rice straw, covered with green herbs, the day after they are formed into thin cakes. (See also *Memoires concernant les Chinois,* Vol. V, p. 498.)

The green juice of the safflower is principally used as above, for scarlet and red dyes, in silk. Amongst the cloths sent by Mons. de Montigny, there was a scarlet one, which, on account of the brilliancy of its scarlet, attracted the attention of the Chamber of Commerce of Mulhausen. That

body wrote on this subject to the Minister of Commerce on the 27th April, 1850:—

"The sample of deep scarlet on cotton, has been ascertained to have been dyed first orange with arnotto then with a rose dye of safflower; but our chemists cannot imitate the brilliancy of the color. They attribute this quality to the fact of the Chinese using a safflower richer in color than that of Spain or Egypt.

Besides having been almost entirely deprived of the yellow color, the Chinese safflower is certainly more rich, and it is said to be four or five times more productive than the best safranum of India.* It is moreover, of several qualities. I have noticed three: the first from 17 to 20 francs the kilogramme; the second from 12 to 15 francs; the third from 8 to 11 francs. These were the prices in 1858, at Canton, at Ningpo, and at Shanghai. Some *houang-hoa,* which had been purchased at 105 dollars per picul at Canton, was received in France in 1850, and some in 1853, which cost, all expenses included, 19 francs, 60 centimes per kilogramme.

The brilliancy and fastness of the scarlet, cherry, and damson dyes obtained from safflower, are owing, in a great degree, if the Chinese are to be believed, to the yellow base. To give this they use the *hoang-tchi,* (fruit of the *Gardenia,*) the *hoang-teng,* and sometimes the *hoang-tchi* (yellow juice of the safflower). It is remarkable that to dry the dyed cloth this scarlet is sometimes exposed to the sun. The color fades a little at first, sometimes passes to a damson, but a certain point attained, no further change takes place on exposure to the light. It is not so if the yellow base is given with the wood of the *hoang-lou (Diervilla versicolor,* Sieb. and Zucc.) and other yellow dyes.

* Is not Mons. Rondot confusing saffron with safflower in this sentence ?—Tr.

4.—*The hooai-hoa.*

I have dwelt further on, on the buds and flowers of the *hooai-hoa.*

5.—*The hoang-pé.*

The *hoang-pé-pi* is the bark of the *hoang-pé-mou,* (*Pterocarpus flavus,* Lour.) or perhaps the *Hymenolobium,* a tall tree indigenous to the provinces of Sse-tchouen and Kouang-si. This bark costs at Canton, on an average 5 or 6 dollars per picul, or about 50 centimes per kilogramme (1845). It is left to macerate in water, for three or four days; it is used cold without mordant, and the cloth dried in the sun; the color thus obtained is a reddish yellow.

Fathers Collas and Loureiro notice the dyeing properties of the *Pterocarpus flavus.* The dyers sometimes use the *Siao-pé (Berberis Thunbergii),* which is less esteemed, in its stead.

6.—*The ti-hoang.*

The *ti-hoang* is the root of a plant, said by Dr. Hoffmann to be the *Rhemnesia Sinensis.* It affords a yellow dye. The *ti-hoang* has large thick rough leaves; the flowers, resembling those of the *yeouma,* are striped in red and violet; the seeds are grey, and contained in a capsule; the root is as yellow as that of a carrot. It grows almost everywhere, but the roots of the greatest value come from Hoai-Khing, in the province of Honan.

7.—*The Kiang-houng.*

The *Kiang-hoang* is the root of the *Curuma longa,* L., very common in the provinces of Honang-toung, Kouang-si, Fokien, Tche-kiang, and Sse-tchouen, &c. It affords the yellow dye most in use, and the cheapest, but also the least durable. The *hoang-teng* is sometimes used to render it more so.

The roots of the *Curcuma* cost at Canton (in 1845), fresh, 5 dollars per picul (about 20 centimes the kilogramme); and dried, 4 taels and 5 mace per picul (about 60 centimes

the kilogramme); in powder 6 taels per picul (about 80 centimes per kilogramme).

Boiling water is poured on the turmeric in powder; it is then stirred, allowed to stand, and poured off. A small glass of citron-juice per catty of turmeric, in powder, is added, and four catties of the latter is needed to dye one catty of silk; other dyers use vinegar in preference to citron-juice, and some use no acid at all.

Ha-sing charged in Canton, in 1845, 3 francs per kilogramme for dyeing silk with turmeric, and 5 francs, 25 centimes, when using the *hoang-teng* or the *hoai-hoa.*

---

## III.

### Of the Galls of China "(Ou-pei-tse.)"

I have mentioned the *ou-pei-tse* above, they are now generally used in Lyons, and it may not be out of place to mention them here.

They are also known by the name of *pe-yo-tsien, yen-fou-tse,* and *yen-kieou-tse;* they abound in tannin. The nuts are of an irregular and sometimes odd shape, light, hard, hollow, downy, and contain a cotton-silk white ball, containing winged insects arranged in swarms. The size varies much; they are sometimes from 2 to 10 centimetres in length, but generally from 4 to 6.

These galls are formed on the leaves of a tree named *yeu-fou-tse-mou* and *fou-mou,* which grow in abundance on the elevated table land in the province of Sse-tchouen, Kouang-si, &c. A species of *Cynips* not yet described lives on this tree; this insect deposits its eggs on the leaves, it covers them in by small cocoons, which enlarge by degrees, harden, and become the galls I am treating of. Here is the description of the *fou-mou* according to the *Japanese Encyclopædia,* Book LXXXIX, folio 21:—

"It resembles the *tchun* (species of *Fraxinus)* its leaves are opposite, long, serrated; they are of a pale green above,

white below; they are slightly hairy, and their taste sour. Below each pair of leaves, straight leaves are arranged sidewise on the stem in the same manner as the feathers of an arrow. The flowers are blue or yellow, arranged in ears. The fruit is of the size of a small *dolichos*, flat, green at first, and violet when ripe. The seeds are of a pale green and kidney-shaped; on the outer skin is found a layer of salt.

According to Dr. Hoffmann, the *yeu-fou-tse-mou* is also called *yeu-fou-chou*, and it is represented in the Royal herbarium of Leyden by specimens referred by Dr. H. Schultes to *Rhus semialata*, Murray, var. *Osbeckii*, Decandolle.

Opinions differ on this point. The *ou-pei-tse* are, according to Dr. Williams, gathered on a species of oak; on the *Terminalia chebula* according to Roxburgh; the *T. edulis*, *Blanco*, according to M. de Azaola, and finally Mons. Decaisne inclines to the belief that they are obtained on the *Distylium racemosum*, S. and Z.

However this may be, the picul of *ou-pei-tse* was sold in 1845 at Lieou-tcheou-fou, in Kouang-si, at from 2 to 4 taels; at Canton, it was from 3 to 6 taels, in the same year; 11½ dollars in June, 1850; 6½ dollars in October, 1850; 8 to 9 dollars in September, 1852; 12¾ dollars in November, 1852.

There are other galls in China and Japan. One of them, the *you-sou-no-mi*, or *ko-to-si*, (in Chinese *kou-tou-tse*) is found on the leaves of a tree, abundant on the islands of Sikok, and Kion-siou, of the name of *fiyon-no-ki* (flaggon-tree) *you-si-no-ki*, *boun-si-mok*, *boun-si-zyon* (gnat-tree). This tree has been described by Kœmpfer, and quoted by Thunberg. A specimen exists in the Leyden herbarium, with the Chinese name of *wen-mou-chou* (Jap. *boun-bo-zyou*) and the Japanese name of *fiyon-no-ki*. Mons. Schultes has recognised it as an hamamelid, the *Distylium racemosum*, S. and Z. described and figured in the *Flora Japonica* by Mons. de Siebold (1835, Fasc. I., p. 179, pl. 94.)

M. Decaisne is induced to believe, as I have already mentioned, that this tree furnishes the *ou-pei-tse,* and it is to be observed that the *Distylium racemosum* bears some of the characters given in the *Japanese Encyclopædia,* and the engraving of the *Pen-thsao-kang-mou.* Li-chi-tchin, author of the latter work, mentions other galls of the same nature as the *ou-pei-tse,* which have some singular properties. Thus the *souan-kio* (sour horns,) very common at Lin-guan-fou, in the Yunan, have the qualities of the best vinegar; the leaves, the galls (?), and the seeds of a tree of Cambodia, the *hien-ping-chou,* also yield vinegar, not less curious than the somewhat apocryphal history of the vinegar polypus of the shores of Leao-tong. A tall tree, with a white flower, tinged with red in the centre, is covered with round galls called *ou-chi-tse.* Lastly, frequent use is made in Canton, for a black dye, of round galls which are named *ko-tse.*

---

## IV.

### Of Blue Coloring Matters.

The Emperor Hoang-ti, who died in the year 2598 before Christ, decreed that the upper part of the dress of the Chinese should be of celestial blue, while the *Tcheou-li* frequently mentions dyeing of stuffs in dark blue, and in light blue; this color is therefore very ancient in China.

The Chinese books call the plants that yield indigo by the name of *lan,* and enumerate five species; the *tcha-lan ma-lan, ou-lan, liao-lan,* and *hien-lan.* The *lan-tien* is the blue extracted from the four last species; that afforded by the *tcha-lan* bears, according to its quality, the name of *tien-hoa,* or *piao-kang.*

The facts I am about to dwell on, have been noticed by myself in China, or obtained orally from artisans; but I am bound to state they do not agree in every respect with the

accounts of the Chinese authors. I have noticed four indigoferous plants; viz:—a plant with opposite leaves, which is an acanthaceous or an asclepiadaceous, a *Polygonum*, an *Isatis*, and one or two *Indigofera*. It would be necessary to know the Chinese name of each species, to take advantage of and reconcile the assertions of the dyers with the cultivation and artistic processes described in the encydopædias. I shall leave my readers to judge, by the example of two species, whether precise specific distinction be necessary or not. The *Thien-kong-khai-wou* names *tien-hoa*, the blue scum gathered from the trenches in which the *tcha-lan* has been steeped, and which has been dried. The *tien-hoa* is the *Indigofera coccinea*, Lour., according to Dr. Williams, and the *Isatis indigotica* according to Mr. Fortune. The *lan-tsao*, is the *Indigofera tinctoria*, L., says Loureiro, and the *Polygonum tinctorium*, according to Dr. Bridgman.

1.—*The Lan.*

The fresh leaves of the *lan* are used to dye a light blue. They were sold in Canton in 1844-46, in the summer, at 400 to 1400 sapees per picul, or at an average of 6 francs per 100 kilogrammes, and in winter at from 2000 to 4000 sapees or at an average of 22 francs per 100 kilogrammes.

When about to dye, the cloth is dipped in cold water, dried in the sun, and dipped in a warm bath of leaves of *lan*, into which a small quantity of lime-juice has been poured. U-ching did not use the latter.

The *lan* is very common in the provinces of Konang-toung-of Fokien and Tche-kiang; I have seen it extensively cultivated on the right bank of the Tchou-kiang, in the neighbourhood of Canton, at Kou-lang-sou, on the banks of the Loung-kiang and its tributaries, from Hai-tching and Chima to Tchang-tcheou-fou; I was assured it was equally abundant in the neighbourhood of Ningpo.

It is difficult to fix the botanical name of the *lan*, or of this species of *lan*. The *ho-lan*, the *lan-tsao*, the *si-lan* are

according to Dr. Louriero, and Drs. Bridgman and Williams, the *Polygonum tinctorium*, Lour. (*Ampelygonum tinctorium*, Lindley.) Two other kinds of *lan*, the *ma-lia* and the *choiu-liao*, are, the first, the *Polygonum barbatum*, L., and the second *P. perfoliatum*, L. No other species is mentioned by writers or travellers, and yet the *lan* of which I am treating certainly differs from all the above. I saw at Canton large quantities intended for the dyers, and I have prepared a description that cannot be applied to *Polygonum*. It runs thus:—

"The *lan*, brought from the suburb of Ho-nan to the dyers of Canton, is in fresh heads, each formed of two or three stems, each stem springs from the neck of the root, and is about 30 centimetres high, the plant is herbaceous, creeping; the root is compound and branching; the branches of the stems are opposite; the leaves are opposite, entire, or triflingly serrated, with feathery branching veins of a fine dark green passing into blue when the plant dries."

The leaves of *Polygoneæ* are *alternate*; the *lan* of which I wrote cannot therefore be one of them, and yet for nearly a hundred years every body has noticed the indigo obtained at Canton from the *Polygonum tinctorium*, notwithstanding my own doubts on the subject, supported by Mons. Margueron, a dyer of Tours, who, declared in 1847, that my description referred not only not to a *Polygonum* but to an indigoferous plant altogether unknown in Europe. I myself committed this mistake; I feared to assert the fact I knew to be certain, thinking it unlikely that one of the most common and most frequently used plants at Canton should have been so entirely passed over as not to be described. The truth is that the matter is still open to conjecture.

As the asclepiads have all opposite leaves, and, as many of them yield indigo, it is possible that the *lan* belongs to that family.

When I was at Canton, having no other botanical work but the flora of Loureiro, I thought I recognized in the *lan*

the *Spilanthus tinctorius* (*Adenostemma tinctoria,* Cassini), with the leaves of which, says Loureiro, an excellent blue dye is prepared in China and Cochin-China with much greater facility than the indigo plant.

Since the publication of the last work of Mr. Fortune, my attention has been again directed to this question. I give in brief the passage devoted to a new kind of indigo by this enterprizing traveller:—" The indigo, which attracted my attention in the province of Tche-kiang is as dear, if not more so, than that of the *Isatis indigotica.* It is obtained from a kind of *Ruellia,* which, until it receive a better name, may be called *R. indigotica.* It is singular that a plant of this genus, perhaps the very same, has been recently discovered in Assam in India, where it is similarly cultivated for the blue dye it yields. Who knows but that we are on the eve of discovering that this species, producing a dye unknown to trade, is cultivated every where, from the eastern shores of China, to the frontiers of Bengal? This *Ruellia* seems to be of easy cultivation, and is without doubt, very productive. Although it evidently applies to a hot latitude, it succeeds perfectly in Tche-kiang as a summer crop. It is planted at the end of April or beginning of May, when spring frosts are no longer to be apprehended; it is cut in October before the autumn frost sets in, and before the flower is formed. During this interval, it attains a height of from 30 to 45 centimetres, becomes very dense, and is covered with leaves (pp. 158-159).

At Canton, which is 7 degrees further South than Ningpo, the *lan* withstands the winter colds, but it is at that time sold three or four times higher than in summer, that is, at 20 to 25 centimes the kilogramme instead of 5 to 10 centimes.

According to Mr. Fortune, the people extract indigo in Tche-kiang from the stems and leaves of this *Ruellia,* by the process of steeping and pounding, and it is sold in

the form of a paste called *tien-ching*, at the rate of 50 to 100 sapaques the catty, say 40 to 80 centimes per kilogramme (pp. 160-163.) At Canton, where they can use during the day the leaves cut in the morning, this preparation is omitted, and the leaves committed at once to the boilers.

I recognize the *Ruellia indigotica* of Mr. Fortune, from a drawing prepared by Mr. Dan. Hanbury, who had before him a specimen in the herbarium of Dr. Lindley. I believe it to be the same species as the *lan* of Canton, and it is under any circumstances, different from the *Spilanthus tinctorius*, Lour. Neither the flower or the fruit of one or the other of these plants, have been seen, but they are so abundant in the parts of China already most frequented by Europeans, that they cannot remain long unknown.

However this may be, it is clear there are several species of *lan*. The dyers agree in distinguishing two of them; the *lan* of the south, and the *lan* of the north. The latter is a *Polygonum*.

The Missionaries at Peking wrote about 1784:—"It seems beyond a doubt that the plant *lan*, or anil, from which indigo is obtained, has been known and cultivated for dye purposes centuries before the Christian era....The anil growing only in the southern provinces, the genius of the Chinese has substituted another plant, and, according to tradition, to extract a semi-indigo from it....This plant is named *siao-lan* in Pe-tche-li, and in the other northern provinces, where it is annually cultivated....It seems certain that the *siao-lan* is a true *Persicaria*, known in France.... The Chinese extract a blue from two other plants."

Father Cebol is equally positive:—"It is only in the southern provinces they cultivate the *nimi-lan*; we have not seen it; it seems to be the true anil of America. In other provinces a dyeing blue is obtained from other plants. That of Peking is a kind of *Persicaria*, on the authority of several Europeans."

Kraschennikow attached to the genus *Persicaria* two species which he had reared from seed sent from Peking by Father Gaubil. That celebrated missionary informed him that the Chinese extracted indigo from these, and the *modus operandi* is carefully described by Father Cibot, and another member of the mission at Peking. Sir Geo. Staunton writes of plantations in the vicinity of Peking of a species of *Polygonum,* which on fermentation yield a fine indigo. Thunberg mentions, and Louriero confirms, the use in China and Japan for blue dye purposes of *Polygonum Chinense, L., barbatum, L.,* and *aviculare, L.,* the Portuguese botanist adding *P. tinctorium.* Finally a species of *Polygonum* is cultivated at Tchou-san on account of its blue color. I saw whole fields of it, which were also noticed by Dr. Cantor.

I learnt from a calico-printer at Ningpo, all that I know of the *lan* of the North. The indigo extracted from it is sold in cakes, under the names of *lan-tien* and *yang-lan.* It is used for printing cloths, and was sold in that town, in 1845, at from 6 to 700 sapees the catty, that is from 4 francs 30 centimes to 5 francs per kilogramme.

2.—*The Tien-hoa.*

At Canton, blue dyes are obtained direct from the fresh leaves of the local *lan;* the indigo extracted from the *lan* of Peking is sold in cakes, while the indigo obtained from the *tien-hoa* is preserved in a state of almost liquid paste.

The *tien-hoa* is a *lan* of the South, the *Isatis indigotica,* Fort. Mons. Fortune has given a good account of this woad, under the name *tein-ching,* accompanied by a figure in the *Journal of the Horticultural Society of London.* It is probably the same plant which Father du Hald calls *tien-hoa,* and Father De Incarville *kouang-tien-hoa.* This *Isatis* grows in almost every province of China, but principally in those of Fokien, Kiang-sou, Kiang-se, Tchi-kiang, Kouang-toung and Kouang-si. A considerable proportion of the

*tien* indigo used at Canton comes from the latter province, and specially from the district of Pe-lieou. At Amoy much is obtained from the island of Formosa, and the district of Thsiouen-tcheou-fou.

It is sold to the dyers as a gummy paste, and they take precautions to prevent its drying up, as when dry it only yields a blackish color. It was sold in 1845 at Amoy, at 45 francs per 100 kilogrammes; at Ting-hai at 42 francs; at from 50 to 60 at Ningpo, and at 90 at Canton.

The *tien-tsing* yields solid dark blues. The boiler is charged with 300 litres of cold water, 38 kilogrammes of indigo of the *tien*, and 1½ kilogrammes of shell lime. For every kilogramme of indigo subsequently put into the boiler 37½ oz. of lime are added, with sufficient water to keep the vessel full. The boiler is charged 6 or 7 days before the period of dyeing. In some factories the cloth to be dyed is first dipped in water tinged with vinegar.

A blue black, in much esteem, is obtained from a mixture of the *lien-lsing*, and the fruit of the *kao-hoa (Fortunæa Chinensis*, Lindl.)

3.—*The Thou-tien, or Tcha-lan.*

There are in China several species of *Indigofera*, and one of them yields a blue dye, but I did not observe that the dyers make any distinction between this indigo and that of the woad. They are generally found for sale together in a state of paste or liquid.

There are extensive plantations of Indigo in the southern provinces of China; especially in those of Kouang-si, Kouang-tong and Fo-kien. I was assured that the cultivation did not extend beyond Tche-kiang, and Mr. Fortune's observations are to the same effect.

The following occurs in the *Thien-kong-kai-wou*, (Book 1, fol. 50):—"For some years past, the agriculturists of the Province of Fo-kien have cultivated the *tcha-lan* on the slopes of the mountains. It yields many times as much

blue as any other kind of *lan*." This passage refers to an *Indigofera*; a Fokienese gardener, who brought me some plants with an *Indigofera* amongst them, gave it this name. This man mentioned three species, differing in their inflorescence. Dr. Wells Williams quotes L. *coccinea*, Lour., and Louriero *I. tinctoria*, which is also cultivated in Cochin-China, where it is called *Cham-nho-la*, and which I gathered in the vicinity of Tourranne.

What I mentioned of the dye of the *tien-tsing*, is equally applicable to the *thou-tsing*. One single dyer, Kong-tching, prepared this for dark colors. He had made several experiments, and he satisfied himself that the blue of the *Indigofera* paste was not only superior to the other Chinese and Siamese indigos, but also to the solid indigos of Java and Manilla. He maintained that it was with this alone a blue-green could be obtained. Mons. de. Bourboulon, minister of France in China, mentions that in the North, a green color is obtained from indigo by exposing the dyed cloth to the frost, and then to the sun.

---

## V.

### Yellow and Green Dye from the Hoai-hoa.

This is the proper place for alluding to the facts published in England by the department of Arts and Sciences, with reference to the *Green Dye of China*. They belong intimately to the question before us.

Prof. Calvert, of Manchester, had called public attention to the green calicos of China. Some manufacturers of Manchester, Messrs. Halliday, Pochin and Co., wrote on the 8th of December, 1852, to the Board of Trade, with the view of eliciting information regarding the *lo-kao*. This request was handed to the Minister for Foreign Affairs, and he directed enquiries to be made in China.

The then British Minister in China, Sir George Bonham, seems to have received reports only from Amoy and Ningpo ;

at least the report of Mr. John A. T. Meadows, Consular Interpreter at Ningpo (13th June, 1853,) and of Mr. Ch. A. Sinclair, Consular Interpreter at Amoy, (18th March, 1853) are the only ones that have been published.

Mr. Meadows says that the stuff used by the Chinese in Chan-toung, to dye calicoes and silks in green, is the *hwae hwa* (*hoai-hoa*) being the flower of the *hwae* tree. According to Mr. Sinclair, cloth is dyed green in the Fokien province, with the bark of the *lo-tse*, potash and alum, and in that of Tche-kiang, with the *hoae-hwa*, the flower of the *hwae*, and alum.

These intimations were received with much surprise, and I may say with doubt, by persons who were well acquainted with the process and products of China; I shall return to these doubts after speaking.

1.—*The Hoai-hoa.*

The *hwae*, or *hoai*, according to French orthography, is the *Styphnolobium Japonicum*, Schott, the *Sophora Sinica*, Rosier, the *Sophora Japonica*, Linn. I shall speak of it by the latter name by which it is best known. It is a large and handsome tree of the order *Leguminosæ* (*Papilionaceæ*), named in the *Tcheou-li*, and acclimated for upwards of a century in France. It was got from China in 1747, by Father d'Incarville and Bernard de Jussieu; some magnificent specimens are to be seen in the neighbourhood of Lyons, and some were cut down at Ecully in 1820 with trunks so large that a man could scarcely embrace them.

The Commercial Delegates in China, who made known to our manufacturers so far back as 1846, the *ou-pei-tse*, the Chinese safflower, gambier, gutta-percha, &c., and brought them into artistic use, also brought the *hoai-hoa* into notice. Their samples of this dye-stuff were carefully examined by Dr. J. L. Henon, and the learned Secretary of the Agricultural Society of Lyons, was the first to discover that it was the undeveloped flowers of the *Sophora Japonica*. Mons.

Decaisne arrived at the same conclusion. He wrote to me that:—"The buds of the flowers named *hoai-hoa* sent to me by you, appear to me certainly to belong to the *Sophora Japonica,* but I know others that differ completely from them, and to which similar qualities are attributed."

Sir W. Hooker, to whom the Board of Trade submitted the *hoai-hoa* sent by Mr. Meadows, also refers it to this species (letter to Dr. Playfair, 7, October, 1853.) Dr. Lockhart forwarded to Mr. Hanbury the *hoai-hoa* of commerce, and some branches of the *hoai* flower, (it is very common in the gardens about Shanghai,) and the opinion pronounced in 1847 by Monsieur Henon, was fully confirmed.

The name of *hoai* is applied to several different plants:—"The tree *hoai,*" according to the *Eul-ya,* "is also named *hoai* (Chinese mode of writing differs). There are several kinds of it, the blue *(tsing),* the yellow *(hoang),* the white *(pe),* the black (*he*) or *tchou-chi-hoai.* That with narrow leaves, ending in a sharp point, and having blue silky appearance, is the *hoai* properly speaking. There is also the *cheou-kong-hoai,* or violet (*tsé*); its stem is weak, its leaves are violet; they close during the day and open at night......The wood of the *hoai* is highly esteemed, it might be used for making furniture, vases and other things." *(Cheou-chi-thong-khao,* Book LXVII, folio 1.) I brought in 1846 seeds of the black *hoai,* the violet *hoai,* the *hoai* of the South, and the yellow *hoai,* gathered in the gardens in the neighbourhood of Canton.

The Japanese name of *hoai,* which is pronounced *kouai* in Japan, is *yen-zjou.* Kæmpfer calls it *quai-kaku,* which means the pod of hoai *(hoai-kio.)* Thunberg writes *iendsu-no-ki,* signifying tree of *yendsu.* The tree was transferred from China to Japan, and was not thoroughly acclimatized in the days of Kæmpfer; it is figured in the *Kwa-wi,* IV, p. 19.

The *hoai-hoa* mentioned by Mr. Meadows, and the one examined by Dr. Th. Martius, coincide with that obtained by the Commercial Delegates from the Chinese dyers.

The *Sophora Japonica* is as abundant in the north as in the south of China, at Peking, as at Shanghai and Canton. It is cultivated from the 23rd to the 40th degree of north latitude; it grows in the provinces of Kouang-toung and Kouang-si; it is found every where in Fo-kien, Tche-kiang Kiang-sou, Ngan-hoei, Honan and Sse-tchouen, and it is equally common in the Provinces of Chan-toung and Tchi-li.

The *hoai-hoa* of the North is held in the greatest esteem.

This dye stuff was worth in Canton in 1845, 8 to 10 dollars per picul, or from 75 to 95 centimes the kilogramme. The *hoai-hoa* of Chan-toung, was sold at Ningpo in June, 1853, at 6000 sapecs, and that of Tche-kiang at 5000 sapecs. The pillar dollar was then valued at 1460 sapecs, and cannot be taken at less than 7½ fr.; so that the price of the first was 51 centimes per kilogramme, and of the second, 43 centimes. According to Mr. Sinclair the picul of *hoai-hoa* was worth in June, 1853, at Amoy, or at Tchang-tcheou-fou, 20 silver taels, or, according to the average exchange of 7½ francs per dollar, 3 francs 45 centimes per kilogramme. This error is the more apparent, as he says that the *hoai-hoa* is abundant in Tche-kiang.

That the *hoai-hou* yields a yellow dye cannot be denied; but according to evidence which it is difficult to ignore, it is also used to dye in green. This difference in fact must lead to new experiments, I merely allude to them.

This stuff was examined in 1851 by Mr. D. Hanbury and Dr. Th. Martius, and in 1853 by Professor Stein, of Dresden. The first obtained a very bright yellow infusion; the second separated by means of alcohol, and lime 11 per cent. of the weight of a pale green powder, which has been named *wai-fine*. The coloring principle obtained by Mr.

Stein, is in his opinion, nothing but *ruio,* and which he believes to be identical with the *wai-fine* of Dr. Th. Martius.

---

### 2. Dyeing in Yellow with the Hoai-hoa.

Father Cibot, of the former mission to Peking, who devoted much zeal and singular precision to subjects connected with natural history and industrial art, then describes the preparation of the *hoai-hoa,* in a paper on Chinese dyeing;—

"The flowers of the false acacia are more generally employed; it is grown everywhere without care, and yields a very fine yellow. When on the point of blowing, they are gathered, separated from the calyx, and dried in the rays of a hot sun, or still better in an iron pan, when they are turned and turned as if they were to be roasted. They are then moistened with the juice of other flowers, piled in a heap, and strewed with salt. When thoroughly manipulated they are formed into balls, and set to dry in a northern aspect. Some people, instead of salt, use lime, or content themselves with sprinkling it over their flowers, after reducing it to a fine powder."

Father Basil, of Glemona, says the *hoai* is a tree resembling the acacia, from the flowers of which a yellow dye stuff is obtained.

The flower furnishes, according to Messrs. Fortune and Hoffmann, a yellow dye; the pulp of the seed-vessel affords, on the authority of Dr. Lindley, a yellow or orange. Rochleder states in his *Phytochemie* (1854, p. 2.) that the viscous substance in which the seeds are embedded yields a yellow coloring principle, which is also purgative like that of *Sophora heptaphylla,* L. Dr. Th. Martius states that the mixture of flower buds, fragments of flower stems and branches sold in China under the name of *hoai-hoa,* is used to dye in fine yellow the silken stuffs intended for the vestments of the mandarins.

Finally, this stuff occupied in 1853 the attention of Messrs. W. Stein and Von-Kurrer as yielding a yellow color.

I saw, and myself used the *hoai-hoa* in China, for dyeing silks and cottons yellow. Mons. Hedde also dyed silks with it at Canton.

Here is the process adopted in the dyery of Hoa-ching of Canton: "The *hoai-hoa* is placed in a vessel full of water; fire is applied, and the whole kept to the boiling point for an hour and a half; the cloth to be dyed having been in an alum bath the whole previous night, is then dipped in."

Another silk-dyer, Kong-tching, whose factory is in Canton, in Tai-tsat-pou, somewhat beyond the long street Ta-thong, where there are large warehouses of cloth, serges, and camlets, shewed me his various plans of dyeing, and I copy the paragraph relating to the *hoai-hoa*: "Take boiling water; put in the *hoai-hoa*, and leave it for some time. After a while the color and the odor are both developed. Pour off; the sediment is of no use. Take this water; add cold water to reduce its temperature, add lime water, and dip the cloth in the bath thus prepared, let the cloth be well shaken, and then rinsed in pure water. After being rinsed, the cloth will be found dyed a fair yellow. A little alum is required to complete the process. Put the cloth first of all in some alum water, for 24 hours: then dip, and the process is complete."

Tchu-yunc, a cotton dyer on the Choe-kioh quay, and Uching, another dyer, adjoining Kong-tching, only use *hoai-hoa* to impart a yellow dye.

It is put to the same use in the dyeries of Ningpo, of Ttchang-tcheou-fou, and of Ting-hae. Sang-sun, a carpet weaver at Ningpo, obtained from these flower buds a lively jonquil yellow on wool and goat's hair. The stuff is used at Ting-hai to dye cloths yellow, which cost 25 centimes the

squaremetre, and to print them at Ningpo and Tchang-tcheou-fou.

Another proof may be added. Mons. Hedde and myself made over this stuff to dyers both in Paris and Lyons, and none of them obtained any thing but a yellow color on silk or on cotton. Even more. Mons. Henon had only just discovered the origin of the *hoai-hoa,* when Mons. Seringe caused the flower-buds of some of the *Sophora* plants in the Botanical Garden of Lyons to be gathered. Messrs. Michel Guinon and Renard obtained a fine yellow from them. The same result attended the use of the flower buds of the *Sophoras* in the Kew Gardens, with this difference, that the color from them was somewhat more intense. (Dr. Th. Martius.)

Messrs. Michel and Guinon exhausted in 1843 their study of the *Sophora Japonica,* and the report presented by Mons. Guinon, on the 13th August of that year, to the Agricultural Society of Lyons, leaves no doubt regarding the dyeing properties of this tree.

"The yellow dye exists," says he, "neither in the bark nor in the wood. Scarcely perceptible in the leaves, it is found in great quantity in the flower buds, and especially in the flowers; but that of the flowers is more brown than that of the buds, a fact that explains the preference given to the latter by the Chinese. The calyx gives but little, the stamina more, while the petals which are *white,* contains a great deal. It appears to be combined with a vegetable acid, which deadens and disguises the color, which passes instantaneously white to a deep yellow under the action of ammonia. This property does not appertain exclusively to the Japanese *Sophora;* it is discoverable in the white flowers of several trees and plants. The common açacia, which also belongs to the family of *Leguminosæ* offers analogies in this respect to the *Sophora,* but in a form much less intense.

"The yellow color is very analogous to that of the woad; but it is not so well suited to produce light yellows, as

straw-colored, &c., which are poor and disagreeable to the eye. In orange yellows, as the gold button, this objection becomes an advantage, and the rich full color possesses a degree of solidity superior to that obtained from a mixture of woad and *annotto*. This latter condition is very important in regard to furnishing materials, although the tint is not quite so pure....

"Alkalis redden the tint....Acids bleach....The bichromate of potash instantly reddens the solution, as well as dyed silk, giving them a light mahogany tint.

"A portion of the flowers of the *Sophora* yields a shade resembling that furnished by three parts of woad, including stem and roots.

Twenty years before, about 1825, Professor G. Giobert, of Turin, had made a report on the *Sophora Japonica*, in which its dyeing properties are merely touched on, but which is interesting as a whole. It was inserted in the *Calendario Georgico* of the year 1826. He writes thus:—

"The yellowish flowers of the *Sophora* of Japan are employed in Japan by dyers, who obtain from them a yellow dye; it is not only from the flowers, but also from the leaves, the branches, and the pulp of the fruit, that a yellow coloring matter can be extracted, the beauty of which can be varied according to the nature of the mordant used to fix it. It has not yet been observed that the seeds are enclosed in a gummy substance, which on being dried, is not affected by humidity in the same manner as other gums, and is not so brittle. Neither has it been remarked that this *Sophora* is gummiferous, and that its gum is equal to gum Senegal or gum acacia.

The Board of Trade submited the *hoai-hoa*, sent by Mr. Meadows to Messrs. John Mercer and Walter Crum. Those gentlemen have recorded the result of their experiments in letters printed in the first report of the Department of Science and Arts. Mr. John Mercer has found

no trace of a green color. He says: "The *hoai-hoa* contains a pure yellow coloring matter, greatly resembling that of Persian berries, and which has the same smell when boiled. It has little or no tannin; a warm solution becomes orange by adding a small quantity of proto-chloruret of tin. I mill mention the results of Mr. Walter Crum's experiments further on.

3.—*Green Dye with the hoai-hoa.*

Dr. Henon said in his note of the 2nd of July, 1847:—

"The *wei-hwa* is used as a yellow, aud perhaps as a *green* dye." According to Messrs. Meadows and Sinclair the *hoai-hoa* does indeed, and alone, furnish a green color.

Here is what Mr. Meadows says:—"To dye 1000 (Chinese) feet of cotton, one foot and a half broad, green, 500 taels (48 kilogrammes .900.) of *hoai-hoa*, 100 taels (3 kilogrammes .780,) of alum; and 500 catties (about 300 litres) of water are required. The whole is boiled for six hours, and then the cloth is dipped in the bath, and the whole boiled for three or four hours, and the cloth dried in the sun. The piece is then again dipped or boiled and again exposed to the sun to be dried; this process once or twice, according to the depth of the color required. It is customary in the province of Tche-kiang," adds Mr. Meadows, "to dye cotton, as also silk, first a light blue, before dyeing either the one or the other green. In the north of China, in the province of Chan-toung for example, the silks and cottons are both dyed green at once," or to use his own words:—"The cotton cloths and silks are not previously dyed a light blue color, but are dyed green from their original color of white."

The information obtained at Amoy by Mr. Sinclair agrees with that collected from the Ningpo dyers by Mr. Meadows. He was told that, in the province of Tche-kiang, the *hoai-hoa* alone was used to dye green, alum being employed as a mordant, and the process being in every respect

similar to that adopted with the *lo-tse*. There is at Amoy only one factory in which they know how to dye cotton with the *hoai-hoa*. At Tchang-tcheou-fou the green of the satins is obtained from the *hoai-hoa*; the process is a secret. Mr. Walter Crum made some experiments with the *hoai-hoa*. He thus wrote to Dr. Playfair on the 8th October, 1853:—

"Adopting the Chinese process, the stuff yields a yellow dye, which in China, after exposure to the sun, becomes green; but here it is only after three or four days that any signs of a commencement of a change of this kind shew themselves." Mr. Crum believes that chromic acid might perhaps have the same effect as a powerful sun, and thinks that the *hoai-hoa* contains a yellow colouring principle, passing into green by the conjoint action of the sun and air.

Two important facts afford further support to these suppositions. Sir George Staunton relates, in his history of the embassy of Lord Macartney, that in the province of Tchi-li, the line of communication between Peking and Tcho, a green dye is used, extracted from the flower and leaf-buds of a species of *Colutea*; while the East India Company sent to the Universal Exhibition in London, some *whi-mei*, yielding a green color, and coming from Chian-toung, and Mr. Fortune asserts that the *whi-mei* is the flower of the *Sophora Japonica*.

4.—*Extracts from Chinese Books*.

These several assertions leave the question in a state of indecision. Mons. Stanislas Julien was so good as to examine at my request the encyclopædias, and speedily found in the *Thien-kong-khai-wou*, a passage, the value of which will be at once understood.

This book is an encyclopædia of the arts and handicrafts of China, published by Song-ing-Sing, in the year 1637, that is towards the end of the Ming dynasty. The following is a

literal translation by Mons. Julien :—" Every *hoai* tree, after some ten years, produces flowers and fruit. The flowers that commence to try themselves (*sic*) and which are not opened, are called *hoai-joui* (buds of *hoai*;) they are used to dye clothes green, in the same manner as the *hoang-hoa* yields a red dye."

"To gather these buds, a thickly warm cloth is spread under and all round the tree, in order to receive them (when made to fall.)

"They are boiled in water: after the first ebullition, they are put to strain in a filter, then dried and broken up with the fingers, and small loaves are made of it. These loaves are used in the dyeries in that state."

"The flowers when once opened assume by degrees a yellow color, when gathered to be used (as a dye) they are mixed with a little lime, dried in the sun, and preserved in that state."

The *Thien-kong-khai-wou* is opposed to other works of equal authority. The *Pen-thsao-kang-mou*, the encyclopædia named *Kouang-kiun-fang-pou*, the agricultural encyclopædia *Cheou-chi-thong-khao*, afford a similar notice regarding the *hoai* which has been borrowed from the ancient dictionary *Eul-ya*. After describing five species of *hoai*, the author of the *Eul-ya* comes to the *tchou-chi-hoai* :—

"There is, moreover, the *hoai* of a black color; it is commonly called *tchou-chi-hoai*; its wood is useless. In the fourth or fifth month its yellow flowers begin to blow. Before they are quite open, the buds have the appearance of a grain of rice. They are gathered, dried in the sun, or roasted over a fire; they are boiled in water, and yield a bright yellow dye."

The *Wei-tsi-yu-pien* describes the manner of preparing dye :—Take half a *ching* of flowers of *hoai*, and roast them until their yellow color is converted to red. Cause them afterwards to be boiled in water. After boiling up two or

three times, and when the color has thickened, throw them on a silken filter. Pound half an ounce of white alum to a fine powder, and also one ounce of oyster shells, add to the juice, and stir till the whole is thoroughly amalgamated. (Book XII, fol. 10.)"

All that can be said is that new experiments must be made. They would be decisive and easy, as the *hoai-hoa* abounds in China, and only costs from 60 to 80 francs the kilogramme.

I have long since thought, and guided my enquiries regarding the *hoai-hoa* accordingly, that in Fokien, at least, that the green dye of China is obtained from the bark of a *Rhamnus* (*lo-tse*) which supplies a blue green, perhaps a pure blue, and the flower buds of the *hoai* yielding a brilliant yellow. The fruit of the *hoang-tchi* is probably used in preference to the *hoai-hoa* in certain localities. In Tche-kiang and Kiang-sou, a second species of buckthorn takes the place of the *hoai-hoa*, or the *hoang-tchi* in the manufacture of the *lo-kao*. I can only thus understand the predominance of the blue element in the *lo-kao* bought at Sou-tcheou-fou, and the inferior quality of the *lo-kao* obtained at Amoy in which the yellow element is strongest.

But this notion, which I venture only to suggest, is not supported by any positive evidence.

### POSTSCRIPT.

Father Helot has stated that the *hong-pi-lo-chou* is the wild species, and the *pe-pi-lo-chou* the cultivated species. I followed this view of the reverend missionary, observing at the same time, that the Rev. Mr. Edkins and Mr. Fortune were of a contrary opinion. Since then I have learnt from Dr. W. Lockhart, who has returned from China, where he resided for twenty years, that the *Rhamnus chlorophorus*, or *pe-pi-lo-chou*, is the wild species, that it abounds in the plains of Kiang-sou, and more especially in the Chinese

burial ground of Shanghai, while the *Rhamnus utilis,* or *hong-pi-lo-chou* is the cultivated species.

---

## VI.

### List of Works, Papers and Reports to be consulted.

[These works are divided into two series; the first comprises only those in which the *green dye of China* is mentioned. They are classified in each series according to date of publication. The word (Bibl.) shews that that work is in the Library of the Chamber of Commerce of Lyons]

---

#### I—Green Dye of China.

1.—Practical Study of the Export Trade of China: by Isidore Hedde, Ed. Renard, A. Haussmann, and N. Rondot, Commercial Delegates attached to the Embassy in China; revised and completed by Natalis Rondot. Paris, 1858, large 8vo. 199 pp. (This work is distinct from the Documents on the Foreign Trade; China Commercial Facts, No. 13, May and June, 1848.) (Bibl.)

2.—Report of the Proceedings of the Chamber of Commerce of the Upper Rhine (at Mulhausen) during the session of 1850, Mulh. 1851, 8vo. pamphlet, 9 pp. (Bibl.)

3.—On a Green Dye Stuff brought from China, by Mons. J. Persoz, 18th October. 1852, Transactions of the Academy of Sciences, 1852, Vol. XXXV, pp. 558 and 559, 4to.

4.—Report on Two Green Dyes used by the Chinese for Colouring Cotton; by Ch. A. Sinclair. Amoy, 18th March, 1853. First Report of the Department of Science and Art, Lond. 1854, 1 vol. 8vo. p. 432.

5.—Note on a Green Organic Matter, used in China for Dyeing Calicoes: by Mons. E. Matthieu Plessy, read at the Meeting of the 31st August, 1853. Journal of the Industrial Society of Mulhausen, 1853, Vol. XXV, pp. 96 to 104, 8vo. (Bibl.)

6.—Some account of the Chinese Green Indigo Plant, with Specimens of the Dye; communicated by Robert Fortune, Esq. Temple of Tien-tung, 30th June, 1854; Hong-Kong, 19th March, 1855. Journal of the Agricultural and Horticultural Society of India. Cal. 1855, Vol. IX, Part I, pp. 105 to 108.

7.—Chamber of Commerce of Lyons. Report on the Green Dye of China, by Mons. F. A. Michel, Member of the Chamber. (6th March, 1856.) Printed by order of the Chamber, Lyons, 1856, pamphlet, 8vo. (Bibl.)

8.—On the Chinese Mode of making Green Dye, from a species of *Rhamnus*, communicated by R. Fortune, Esq.; with a few remarks on the treatment of the plant, as pursued in the Society's Garden, by J. MacMurray, Head-Gardener. July, 1856. Journal of the Agricultural and Horticultural Society of India. Cal. 1857. 8vo. Vol. IX, Part III, pp. 274 to 279.

9.—The Green Dye of China. Note by Father Helot, Jesuit missionary in China, on the manufacturing processes of Azé, in Tchi-kiang, September, 1856. Extracted from the Theological Studies, Philosophical and Historical Studies; 8vo. pamphlet, bearing the little of Miscellaneous. The note of Father Helot occupies the pages 18 to 34. Paris, 1857. (Bibl.)

10.—Note on a Green Dye from China, by Daniel Hanbury; from the Pharmaceutical Journal for October, 1856. 8vo. (Bibl.)

11.—Of the Chinese Green Dye Stuff, *Lu-koa*, by J. A. Van Eijk, Amsterdam, 1856. The Volksvlijt, September and October, 1856, pp. 410 to 417; 8vo. pamph. (Bibl.)

12.—Further Notes on the Chinese Vegetable Dye-stuff named *lukoe* or *weifa*, by Prof. S. Bleekrode. Amsterdam 1856. The Volksvlijt; September and October, 1856, pp. 412. 8vo. pamph. (Bibl.)

13.—Report presented to the Chamber of Commerce of Lyons, by Mons. A. F. Michel, on the Green Dye of China, and the plants from which it is extracted; 8th January, 1857. (Inserted in the publication No. 14.)

14.—Chamber of Commerce of Lyons; Prize for Enquiries into the Existence of the Green Dye of China in Indigenous and Exotic plants. Printed by order of the Chamber, Lyons. 1857, 8vo. pampht. .(Bibl.)

15.—On the Manufacture of the Chinese Green Dye, called *lo-kao,* by the Rev. Father Helot (an English translation of the memoir of Father Helot.) Pharmaceutical Journal for April and May, 1857, 8vo. (Bibl.)

16.—Notice of the Two Species of Buckthorn which furnish the Green Dye of China, by Mons. J. Decaisne. Transactions of the Academy of Sciences, Meeting of the 1st June, 1857, Vol. XLIV, 1840 and 1841, 4to. (Bibl.)

17.—Letter from Father Helot to the President of the Central Council of the Propagation of the Faith.—Shanghai, 6th April, 1857, *Salut public* of Lyons, (Newsp.) 11th July, 1857. (Bibl.)

18.—Of the Preparation and Use of the Green Dye *of* China *lo-kao;* by Ch. T. M. de Grijs. Amoy, 30th May, 1857,) 8vo. pamphlet. The Volksvlijt, 1857, Nos. 8 and 9, pp. 313 to 319 (Bibl.)

19.—Further Particulars on the Green Dye of China named *lo-kao,* by Prof. S. Bleekrode, Amsterdam, Sept. 1857, 8vo. pamphl. Volksvlijt, 1857, Nos. 8 and 9, pp. 320 to 323. (Bibl.)

20.—A Residence among the Chinese; Inland, on the Coast, and at Sea; being a Narrative of Scenes and Adventures during a Third Visit to China, from 1853 to 1856; by Robert Fortune, London, 1857, 1 vol. 8vo. pp. 157 to 170.

## 2.—Dyeing in Green.

21.—*Pen-thsao-kang-mou;* by Li-chi-tchin, published in the 24th year of the Wan-li period. (1593.)

22.—*Thien-Kong-kai-wou,*—small Encyclopædia of Arts and Handicrafts; published by Song-ing-sing in the year 1637 (under the Mings) 3 vols..

23.—*The Amaltheum Botanicum;* by Leonard Plukenet, London, 1793, 1 vol. 4to. pp. 29, 182 and 183, tab. 408 and 448.

24.—*Kouang-kiun-fang-pou.* A Botanical Encyclopædia, published by order of the Emperor. 1708. It was the Emperor Khang-hi who originated the plan of the work, and who was the principal Editor. 24 vols. in 4to.

25.—*Wo-han-san-thsai-thou-hoei.* Japanese and Chinese Encyclopædia; printed in Japan, in 1713, 80 parts, 4to.

26.—*Cheou-chi-thong-khao.* Encyclopædia of Agriculture, published in 1737, by order of the Emperor Khien-loung. 24 vols. in quarto.

27.—Descriptiones variorum plantarum, by Stephen Kraschennikow. Of the *Persicaria*, Novi commentarii Academiœ, scientiarum Imperialis Petropolitanæ. In 4to. Vol. I, 1750, pp. 375 to 377.

28.—Travels of a Philosopher, or Observations on the Habits and Arts of Africa, Asia, and America, (by Poivre.) Yverdun, 1768. 1 vol. 12mo. p. 95.

29.—A Voyage to China and the East Indies; by Peter Osbeck, Rector of Hasloef and Woxtorp; translated from the German by J. Reinbold Forster, London, 1771, 2 vols. 8vo.

30.—Memoirs concerning the History, Sciences, Arts, &c., of the Chinese, by the Missionaries at Pekin, 1776 to 1814. 17 vols. in 4to. Vol. V. p. 495 to 540; Vol. XI, 73 to 77, 315 to 320, 333.

31.—C. P. Thunberg, Flora Japonica, Leipsic, 1784, 1 vol. 8vo. pp. 108, 109, 166, 167, 178.

32.—Treatise on Plants that are used in Dyeing and Painting, by Buchoz, Paris, 1785. 1 vol. in 12mo. pp. 125 to 135.

33.—Flora Cochin-Chinensis: sistens plantas in regno Cochin-China nascentes. Quibus accidunt aliæ observatæ in Sinensi imperio, Africa Orientali, Indiæque locis variis. Omnes despositæ secundum systema, sexuale Linnæanum. Labore ac studio Johannis de Loureiro. Ulyssipone 1790, 1 vol. 4to.

34.—Collection of Processes and Experiments on the Fast Dyes given out by our Plants to Woollens: by Citizen Dambourney, Paris, Year 1. 1 vol. 8vo. pp. 55, to 72. (Bibl.)

35.—Voyage to Canton, followed by Observations on the Voyage to China, of Lord Macartney and Citizen Van Braam, and by a Sketch of the Arts of the Indians and Chinese, by the Citizen Charpentier Cossigny, Paris. Year VII, 1 vol. 8vo. pp. 224, 232, and 588.

36.—Means of Improving and Restoring submitted to the Government, and to the Inhabitants of the Colonies, by Citizen J. T. Charpentier Cossigny, Paris, 1803. 3 vols. in 8vo.

37.—Handbook of the Trade of India, by Pierce Blancard, a former navigator. Paris, 1806, 1 vol. small fol. p. 345.

38.—Of the Woad, the Indigo plant, and other plants from which a blue color can be extracted; by C. P. de Lasteyrie, Paris, 1811, 1 vol. 8vo.

39.—Experimental Researches concerning the philosophy of permament colors, and the best means of producing them by dyeing; Calico-printing, &c., by Edw. Bancroft, Lond. 2 vols. 8vo. Vol. I, pp. 189, 190, 264 to 276, 285, 286. Vols. II. pp. 106, 107, 110.

40.—China; by the Abbé Grozier. Paris. 1819. 7 vols. 8vo. Vol. III, pp. 81, 274, 282, to 285.

41.—Memoir on the Family of Rhamnads, or natural and medical history of the Genera that compose that group of

Plants; by Adolp. Brogniarh. Paris. 1826, 4to. pamph. (Bibl.)

42.—Of the Sophora of Japan; by Professor Giobert.—Georgico Calend. of the Royal Agricultural Society of Turin, for 1836. Turin. 8vo. pp. 24 to 26.

43.—Complete treatise of the properties, the proportion, and the uses of coloring matters and colors; by J. Ch. Lenchs. (translated from the German) Paris. 1820, 2 vols. 8vo. Vol. I, pp. 174, 182, 350 to 353, 434 to 438, 447 to 458.

44.—Chemical lessons applied to painting; by E. Chevreul. Paris, 1829-30, 2 vols. 8vo. 30th Lesson.

45.—An historical and descriptive account of China; by H. Murray, J. Crawford, P. Gordon, Th. Lyon, W. Wallace, and G. Barnett. Edin. 1856, 3 vols. 12mo. Vol. III pp. 297 to 380.

46.—Report to the Chemical Committee, by Mons. Gustave Schwartz, on the Vegetable Green sent to the Industrial Society by Mons. Cezard, of Nancy, Corresp. Memb. in Batavia. Read at the Meeting of the 27th Sept. 1837.

Journal of the Industrial Society of Mulhausen, 1838. Vol. XI, pp. 25 to 32, 8vo.

47.—Hortus Floridus Cocincinæ.—Dictionarium anamitico-latinum, primitus inceptum ab P. J. Pigneaux, Episcopo Adranensi, dein absolutum et editum ab J. L. Taberd, Episcopo Isauropolitano. Scrampoor, 1838. 1 vol. 8vo. pp. 621 to 658.

48.—A Chinese Chrestomathy in the Canton dialect; by E. C. Bridgman, Macao, 1841. 1 vol. 4to. pp. 450, 453, 457, 459.

49.—The Indigo dyer's art; or treatise of the Indigoferæ, and of the manufacture of Indigo, by Perottet. Paris, 1842. 1 vol. 8vo.

50.—An English and Chinese vocabulary, in the court dialect; by S. Wells Williams. Macao. 1844. 1 vol. 8vo. pp. 103 to 110.

51.—Flora de Filipinas; by Father Manuel Blanco, Augustin Monk. 2nd edit. Manilla, 1845, 1 vol. 4to.

52.—A notice of Thein-ching, or Chinese Indigo; by Robt. Fortune. The Journal of the Horticultural Society of London, 1846, Vol. I. p. 269.

53.—Dye stuffs and dyeing processes in use in the Province of Tenasserim, and in the Island of Sumatra, by Natalis Rondot. Proceedings of the Academy of Rheims, 1846-47. Vol. II, pp. 33 to 36, 141 to 144. 8vo. (Bibl.)

54.—Of the *Wei-hwa;* by Dr. Henon.—Annals of Physical and Natural Sciences, of Agriculture, and Industry. Published by the Royal Society of Agriculture of Lyons, Vol. X. pp. 531 to 533, large 8vo.

55.—Report on the *Wei-hwa* on behalf of a Commission consisting of Messrs. Michel and Guinon. Annals as above, 1847, Vol. X, large 8vo. (Bibl.)

56.—The art of dyeing woollen fleeces, thread and stuffs, by D. Gonfreville, Paris, 1848, 1 Vol. large 8vo. (Bibl.)

57.—Chamber of Commerce of St. Etienne. Systematic description of the several items collected during a voyage to China by Isidore Hedde. St. Etienne, 1848, 1 Vol. large 8vo. pp. 165 to 171, 176, 177. (Bibl.)

58.—Natural history of simple medicamens, by Guibourt, 4th Ed. Paris, 1849-50. 4 Vols. 8vo. Rhamnads, Vol. III, pp. 494, 495. (Bibl.)

59.—Account of a new dye-stuff, by W. Stein (Chemico-pharmaceutical Shut. Leipzig, 27th February, 1850, Lib. 9, p. 140, 8vo. (Bibl.)

60.—Indigenous names of a selection of plants from Japan and China, identified by means of specimens in the Netherlands Herbarium; by Messrs. J. Hoffman, and H. Schulles, 1852. Asiatic Journal, 4th Series, Vol. XX, pp. 267 to 370, 8vo.

61.—Note on a yellow and volatile dye-stuff, obtained from the *Rhamnus Frangula;* by L. A. Buchner, March,

1853. Journal of Pharmacy and Chemistry, 3rd series. Vol. XXIV, pp. 50 to 33, 8vo.

62.—Of a new dye-stuff from China, by M. Stein, Chemico-pharmaceutical Shut. Leipzic, 30th March, 1853. No. 13, p. 193 to 198, (Bibl.)

63. Report on a green dye used by the Chinese for coloring cottons and silks, by John A. T. Meadows, Ningpo, 13th June, 1853. First Report of the Department of Science and Arts. 1854, 1 Vol. 8vo. pp. 431 and 432.

64.—Correspondence relating to a Chinese green dye (Letters of Messrs. Walter Crum, John Mercer, and W. J. Hooker.) First Report of the Department of Science and Art, 1854. 1 vol. 8vo. pp. 430 to 436.

65.—Memoir of the green coloring matter of plants; by J. A. Hartman; read at the meeting of the 22nd February, 1844. Bulletin of the Industrial Society of Mulhausen, 1854, Vol. XXVI, p. 283 to 288, large 8vo.

66.—On the *Wei-fa*, the unexpanded flower buds of *Sophora Japonica*, L., by Dr. Th. W. C. Martius.—Pharmaceutical Journal for 1854, 8vo. (Bibl.)

67.—Of the Chinese yellow dye-stuffs; by M. V. Orth.—New Repertorium for Pharmacy, Munich, 1855, Vol. IV, pp. 12 to 17, 8vo. (Bibl.)

68.—Of the Chinese yellow dye-stuffs; by Prof. Fr. Bochder, in Prague. New Repertory of Pharmacy, Munich 1855, IV, 8 and 9, p. 365, 8vo. (Bibl.)

69.—Universal Exhibition of 1855.—Reports of the mixed international Juries. Paris. 1856, 2 vols. 4to. Vol. I, p. 576, (Bibl.)

70.—On Indian and Colonial products, useful as foods and manufactures, by J. Forbes Royle. Reports on the Paris Universal Exhibition. Lond. 1856, 8vo. Part III. p. 208. (Bibl.)

## *Remarks on the cultivation of Cotton in the Sonthal Pergunahs; by* Mr. P. Burke.

*To the* Secretary *of the* Agricultural *and* Horticul. Society, Calcutta.

Dear Sir,—I must apologize for not having sent you these few lines earlier; absence from home has made me defer writing to you before this.

The subject of this letter will be on the Cotton of this district, of which I send you a small sample.*

The district in which this cotton is grown is the Sonthal Pergunnahs, Dominkoh, and the locality, the Goomanee valley, which runs nearly from West to East, and enters the Ganges about 25 miles below Rajmahal.

I have found this plant growing on all the hills and smaller vallies tributary to the Goomanie, and in the country between the Rajmahal hills and the Ganges. (On the high lands.)

The best land for this cotton is above Buhite on the Goomanie, in the upper part of the Upper Goomanie, in the Bureo valley, the valley of Dumnee, up the Singlam, up Dandooa, and the surrounding hills up the Jumoonee and surrounding hills.

I have found the best plants growing on clay soil, and a red stony soil: those found growing on the banks of the Goomanie in sandy soil are not so healthy looking, though the cotton produced was good. The cotton found growing below Buhite, is on undulating clay soil, at the foot of the hills surrounding the alluvial plains in the Upper and Lower Goomanie. The same is the case with the cotton growing between the Ganges and the hills. I have found none growing on the alluvial soil of the Ganges at the foot of the hills.

* The color of this cotton in reported to be good, but the staple is rather short; it would, nevertheless, prove an useful cotton for the English mills: value 6*d*. per lb.

With this general outline of the locality in which this (short stapled upland Georgia) cotton is grown, let me turn to the manner, &c., in which the Sonthals grow it.

I am told by the Sonthals that this seed was introduced from the Damooda River, or from Chota Nagpore, about fifteen years ago; it was subsequently introduced by Mr. Pontet from Bhaugulpore. The accounts of the introduction of this plant gathered from the natives is very unsatisfactory; some say Mr. Pontet introduced it about five or six years ago, others that it came from Chota-Nagpoor ten to fifteen years ago, but all agree on this one point that they have seen it growing in the country for about six years before the Sonthal insurrection.

The cultivation is as follows. In May and June the lands are prepared for Indian corn, which is sown in the above months. The cotton is sown sometimes with the Indian corn, but generally in the months of August or September. After the Indian corn is pulled, the cotton is allowed to grow up, but seldom receives more than one weeding, and is never watered. By the month of December it is from a foot and a half to two feet in height, and is found covered (8th May) with flowers and pods, the latter just ripening. For want of water in the months of November, December, and January the hundreds of flowers that appear drop off, and with them the young pods, and only a few stand the bad treatment they receive. The plant does not seem to suffer much from this treatment. I have often found these plants growing on good moist soil among jungle, with three or four hundred pods on such plants, covering twenty-five square feet, but for want of the rays of the sun not one ever ripened. Rain does not seem to improve this plant; it has the effect of making it throw out blossom and look healthy, but it retards and injures the pods ready to open. Any thing like a shade for five to seven days will injure the cotton. During the rains little more is required to be done than a

couple or three weedings; the heavy work commences in December and January, and still heavier in March and April, the watering, picking, &c.

It is out of the question to think of getting the natives to cultivate this staple fit for the English market. I have repeatedly given and offered rewards to get them to water small patches; they think it too laborious. As the land is now allotted, it is a very laborious task to water a cotton field, there are no wells nor tanks for the purpose, and they are not likely to be constructed by these people. This plant must be cultivated by Europeans, and the only question to be decided is, what would the average produce be per biggah. I find it a matter of impossibility to get a correct account of the small plots grown by these people.

In a neighbouring field, covering one-tenth of a biggah the produce was this season I am told 7 seers of kapas. During the month of March it was so neglected and injured that the produce was not worth gathering; it had been overrun half a dozen times by cattle, which are very partial to this plant. A great many more fields were in worse condition. I took this plot in hand, and had it watered several times, and the result was a gradual improvement in the cotton, until it became as good as what I am sending, and the produce in a couple of weeks was 1¼ seers kapas. The trees are still in pod, but have been injured by the great quantity of rain we have had lately. The produce of this field was 8¼ seers kapas, or nearly 28 seers of cleaned cotton per biggah. Rats destroyed a great quantity of the produce of this field, and may be put down at 3 seers of cotton a biggah. This would not be the case if cotton were largely planted, for the fields would not be so near village granaries, and these vermin could be destroyed.

I am told by these people that if this plant be watered while in flower, the young pods will not fall off, which has been the case with the plants I have tried. Each plant

will produce 3 to 400 flowers, some 8 to 900, the produce of so large a number of flowers under the present mode of cultivation is not more that 16 pods a tree. When a few trees have had the fortune to be near water, I have seen 300 pods on a tree; from this you will see that by care and irrigation the produce would be very much increased, but any thing in the shape of a damp atmosphere, or cloudy week or two, injures the cotton; what it requires is the roots moist, and branches kept well dried. We have wild cotton plants here also, but I have not made any inquiries as to their produce, &c.

We have several kinds of Dasee cotton also, which are highly prized by the inhabitants, because they grow without much care, but the produce is a *very short staple*, and of a yellowish brown to brownish white color, and unfit for the English market. The produce of this kapas is three of seed and one of cotton, the American kapas yields from two and a half to two of seed and one of cotton.

I think this a very suitable country for planters to grow cotton. I have found, while residing here during the last five hot seasons, the weather much cooler than any part of India from the Punjab to Calcutta, during March and September. I have been told by residents in the plains, that Bengal has not experienced summers so hot during the last five years as it was before this date, which will account for the improvement here; the climate may be considered as the same as is experienced in Bengal, without any dampness.

I have sown some upland Georgia cotton seeds this season in a garden, which were put down in December, but were unfortunately eaten up by cattle several times, and about two weeks ago by locusts; they are now one foot in height, and look healthy and vigorous. On sowing a second plot of the above seeds, I find they have failed. I only wish now I had written for more Pernambuco seed—the cause

of the failure, is the seed becoming too old and eaten up by insects in December—scarcely a single seed missed.

This plant ought to be sown in May or June, six feet apart, as by the month of December they will cover that space; they require watering in November, December, January, February and March while in blossom. There is every facility for making reservoirs for water at a small cost, and the expense for cultivation very much reduced. This land will repay the investment of money for irrigational works; as an example, I may tell you, by watering, &c., I have made this ground produce very much more them these people: for instance, on the borders of a garden, castor-oil seed, taken care of, one-quarter of a biggah gave three maunds—native culture average two maunds a biggah; potatoes eight maunds a biggah—well looked after forty maunds a biggah; gram eight maunds a biggah looked after—not cared for by these people, four maunds the biggah. The same with all other crops. An improvement in the mode of cultivation would more than repay the expences, I have found that a couple of Rupees extra on cultivation more than repays the investment. The way these people argue against this theory is as follows: they say land here costs only one anna per biggah, and a man with a pair of bullocks can cultivate five biggahs in fifteen days, which if sown with mustard will give ten maunds, price 15 Rs.—expence for cultivation 1 Rupee 8 annas. Now they say if they cultivate two biggahs well, and it gives four maunds the biggah, they will only get 12 Rupees, and have more labour over it. The rent is no consideration here; the plough over an extensive cultivation with these people will do more than good cultivation; even four times the produce is no consideration, for by the present mode of cultivation only one biggah is invested, and, by an improved mode, manual labour will be necessary and money invested on the above field. These people pay 5 annas rent; the 1 Rupee 8 ans. cultivation goes to their own account, produce 15 Rs.,

or nearly fifty times the outlay. By an improved mode, rent 2 ans., labour 4 Rs. interest on labour at 150 per cent, let it be for ever so short a time, makes 6 Rs., total Rs. 10-2 ans.—this very item alone would deter them—produce say twelve maunds on two biggahs, or 18 Rs.—balance 7 Rs. 14 ans., which is much less, with greater trouble and risk. When the price of land rises to what the market would readily give this moment, then will these people cultivate small patches, and make them return as much as the large tracts now under cultivation. Allow me to finish here for the present.

KOOSMA:
12 *May*, 1859.

---

The Pernambuco seed you sent has been received by me. I regret to inform you the seed was very bad. I had to throw a large portion of seed away, as they were worm eaten. Out of the sound-looking seed I have only been able to secure a dozen plants, from which I am in hopes of securing seed for next season; these plants look as healthy as any cotton in the country. I will now make a few remarks on the seed I received from the Chamber of Commerce. In the early part of the year I received two casks for distribution and trial. The cask was completely damaged from water that must have got in, for a white powder covered a portion of the seeds. The second cask was very fresh and good, not a single seed missing. The early sowings in May and June are now four to five feet in height, and the stalks nearly an inch in diameter, the later sowings have suffered much from the rains. In consequence of the fracture of the first cask, I had recourse to transplanting from the good fields, in order to save seed for next season. After transplanting, I allowed the long grass to grow up, and protect the young plants from the heavy rains of July, August, and September, and the result has been

nearly all the plants have come through the rains in good health. No cotton plant will grow or increase in size during the heavy rains in July, August, and September; measure the plant on the 18th of July, and again on the 25th August, and you will find it to be the same size. I tried weeding two large fields of transplanted cotton during the rains, but nearly all the plants died. Cotton sown broad cast does not suffer from weeding during the rains. In two fields, a portion of the plants were six inches deep in water for two months, one field is now dry, and the plants, though stunted in growth, are doing very well; the other field is still under water, and may continue so for another month. One-eighth of a biggah of the first field was under water, and nearly half of a biggah of the second.

I will now turn to the early sowings, and say, the cotton sown in May during the time the Indian corn was sown, is in the best of health; and the largest plants stand five feet in height, and about the same in diameter. They were sown broad cast, thickly, and, as they grew, were transplanted as above; they are bearing abundantly at present. The people in this part of the country have never seen anything like it, though they have a plant, I consider, identical with these. If natives will continue to sow cotton with other crops, they cannot expect a good crop of cotton. This plant has been in flower ever since the end of June, and will continue so I expect until next rains. I cannot be positive as to the quantity of cotton it will produce, as the cotton will not begin to ripen until after the rains, or about the middle of November. I will let you have an estimate of the cost of cultivation and produce when it is gathered, but at present allow me to assure you that if cotton is well cultivated, it is far more profitable than any crop of country produce in the country. On the 20th August the heavy rains ceased, when all the old leaves dropped off, and new leaves and flowers appeared, and now the plants are covered

with buds, flowers, and pods; some plants have hundreds. The average number of large pods now on the trees, not reckoning small pods, flowers, and buds, ought to yield fifteen seers a biggah; some plants have as many full grown pods as would yield one maund a biggah. This is the produce of the last month, out of which I must deduct one week very heavy rain we had in September, and which did a great deal of harm to the cotton on the plants. I expect we will suffer some damage from the coming rains in October, from which date I may reckon the cotton season. As I said above, I have no doubt but the cotton will be a very profitable crop, if it is only well cultivated; the cost will range from eight to twelve Rupees per biggah, poorer lands and indifferent cultivation one quarter of the above. The produce of the first mentioned will be from one and a half to two maunds of cotton per biggah, a return from Rs. 24 to 32 Rs. per biggah, at any rate, at a very low estimate, it will give 100 per cent. As to carelessly cultivated cotton, I would put its expenditure down at 4 Rs. the biggah, and the return at 25 seers of cotton, or 10 Rs. the biggah. The native prefers keeping to the last figures, and thinks it pays well enough. This is all very well for native culture, but it would not do to be followed by Europeans.

I will now just make a few remarks about the land, &c. I think it would be well if your Society would use their influence and interest to induce Government to let land to Europeans in this part of the country. There is little use in our pointing to the snowy range, as sites for farms, &c., &c.; the best place to grow cotton is in these provinces, in which it is found to thrive; but there are very large tracts of country in the Zillahs Bhaugulpore, Dinapore, and the country lying west, now lying waste, and under jungle, which are given out at so low a rent, that it does not pay to collect it. The average rent of the Dominkoh, must be about 2 pice a biggah. Government can not only assist the establishment of cotton

plantations, but turn this extensive tract of country into a source of revenue. Let no lands be given out as Zemindaries, &c.; let the land be divided into lots, and a higher rent fixed on the land. This might be introduced gradually, by having farm-lots, of 1500, 1000, and 500 biggahs, &c., as parties offered to take the farms; if the land was cleared of jungle, let Government charge 4 ans. and 8 ans. and a rupee per biggah. I would not make over whole villages to any one, or bring the natives under the influence of any but Government. To accomplish this task, I would let plantations of a limited size, scattered over the country, and give no one farms larger than is actually required. A plantation of 6000 biggahs would require 40,000 Rs. outlay to work it, with a large capital for stock on hand. Smaller farms would suit individuals with a smaller capital.

The reason I request you to use the influence of your Society on this subject is, that parties propose embarking in cotton cultivation next cold season, who will in all probability experience some difficulty in getting land, though the authorities here are anxious to assist in the project.

"I expect to have a good supply of cotton seed on hand next season, but as it may not meet the demands of those who propose to embark in this speculation, I shall feel thankful if you could send me any seed you can spare. Before I finish this, I may mention I employ coolies at 3 Rs. per month, keeping their daily time; in the rains, the coolies prefer working half a day on half hire. When extra hands are required, I engage men at 6 pice a day, and women at 4 pice per day.

KOOSMA:

*24th September*, 1859.

## *Report on the sale of Punjab grown Flax in the markets of Dundee and Belfast.*

*(Communicated by the Honorable the Lieut.-Governor of the Punjab.)*

*To the* SECRETARY AGRICULTURAL AND HORTICULTURAL SOCIETY, CALCUTTA.

*Dated Lahore, the 13th October,* 1859.

Revenue Dept.

SIR,—I am directed by the Honorable the Lieutenant-Governor of the Punjab to forward for the information of the Agricultural and Horticultural Society, copies of the documents marginally detailed, regarding the sale, in the markets of Dundee and Belfast, of flax grown and prepared in the Punjab; and to convey his Honor's suggestion that the success of the experiment may be published as widely as possible under the auspices of the Society.

From Financial Commissioner No. 457 dated 20th July, 1859.

From Secretary to Government Punjab to Financial Commissioner No. 1238 dated 13th Oct.

I have, &c.
R. H. DAVIES,
*Secy. to Govt. Punjab.*

---

*To* R. H. DAVIES, ESQ.,
*Secy. to Govt. Punjab and its Dependencies.*

*Dated Lahore, 20th July,* 1859.

SIR,—In continuation of my predecessor's letter No. 71, Revenue, *(Flax.)* dated 15th February, 1859, I have the honor to report, for the information of His Honor the Lieutenant-Governor, the financial results of the flax operations therein detailed. I beg also to submit in original (for the perusal of His Honor the Lieutenant Governor), the report* furnished by Lieut.-Colonel Clarke, of the result of operations up to the date of the transmisson of a portion of the produce to England.

* No. 77, dated 2nd March, 1857, with 7 enclosures.

2. It has been before stated, in the letter above quoted, that the 2 tons of Goojranwalla flax, upon arrival in England, were forwarded by Lieutenant-Colonel Burnett, to the Royal Flax Society of Belfast. Of the 28 bales despatched, a selection of 9 bales, containing fibre more suitable for the Dundee market, was forwarded to that city, and the remaining 19 bales disposed of at Balfast.

3. The 19 bales realized the sum of £63-6-4, at prices varying from £35 to £45, and upwards per ton; those sold at Dundee realized £28-15-10, at £45 per ton: total £92-2-2.

4. I now proceed to compare these results with the outlay incurred from the commencement.

5. It will be remembered that a sum of 1,500 Rupees was, in the first instance, sanctioned by Sir John Lawrence, not for the exportation of flax, but for growing it experimentally under the eye of Mr. Steiner and Colonel Clarke, in the district of Goojranwalla.

6. At the conclusion of these first operations, and up to the date of the shipment of the selected flax for transmission to England, it appears from Colonel Clarke's report that, of the amount originally sanctioned, about Rs. 695-7-4 remained unexpended, the balance of about Rs. 804-8-8 (or as it turned out afterwards to be Rs. 804-14-1) had therefore to be made good by the sale of the remaining flax produce, to render the experiment a self paying one.

7. Of this amount, a sum of Rs. 77-2-5 was realized by the sale of flax remaining on hand in this country; hence a balance of Rs. 727-11-8 had to be made good by the net profits of the sale of the flax despatched to England. But even this amount does not represent the true balance, as a considerable portion of the seed and inferior fibre was distributed gratuitously among the zemindars.

8. It has been before stated that the gross amount realized from the sale of flax was £92-2-2; from this has to be deducted the expense incurred in the transport, storing, and sale

commission of the article, which, it will be perceived by the annexed statement, amounts in the aggregate to £30-17-1. The balance therefore to be set against the sum of Rs. 727-11-8 is £61-5-1, or Rs. 612-8-0, counting the rupee at 2 shillings. The result is a loss to Government, on the whole transaction, of Rs. 115-3-8, a loss considerably less then was estimated by Colonel Clarke.

9. The deficit thus shown is a deficit upon the whole experiment, the object of which was originally not to ascertain whether the exportation of flax could be remunerative, but to make investigations regarding the soil best adapted for its culture, and to initiate the zemindars into the processes required for preparing the fibre for the European market.

With regard, however, to the other question, an answer can be supplied by taking the value of the flax exported at its market rate in the Punjab, and comparing it with the net proceeds obtained by the sale of it in England.

10. Valuing, then, the two tons of fibre at the amount it was valued at the time of despatch, that is Rs. 315-12-4, it appears that, after deducting the sum of Rs. 808-8-0, as cost of transport, &c., from the proceeds realized in England, the net sum of Rs. 612-8-0 has been obtained, *i. e.*, 94 per cent. over and above the market rate of the article in the Punjab, and upwards of 47 per cent, upon the whole outlay.

11. It must be stated, however, that too favorable conclusions must not be drawn from these figures for several reasons.

In the first place, the market value of flax fibre at the time of despatch was very low, while the flax market in Europe was particularly favorable. In the next, the cost of transport in India was considerably diminished from the fact of the cargo being a Government one. At the present time, the cost of flax fibre, even before preparation, is not less than Rs. 8 per maund, or Rs. 224 per ton=£22—8; and the cost of transport from Lahore to shipboard at Kurachee, for private

traders, is estimated by Mr. Cope, Commission Agent at Umritsur, (whose experience on this subject gives great authority to his statement) at from £8 to £9 a ton; still even at these high rates, it may be shown that, flax grown in the Punjab can be delivered on shipboard at Kurachee at £30 a ton, thus leaving, should the market of Belfast continue favorable, a margin of from £5 to £15, to cover the expenses of freight to England, and for profit. The calculation however is made under unfavorable circumstances, and at very high rates; and it is ally believed that in practice, both the cost of flax and of its transport to Kurrachee, would be found to be much lower; and when, as Mr. Steiner, the late Superintendent of Flax Operations, confidently anticipates, flax fibre ready scutched for the English market, shall be producible in the Punjab at from 4 to 5 Rs. maund, and the railway shall have provided us with comparatively cheap communication with our eastern port, there can be no doubt whatever, that the exportation of the flax fibre, from the Punjab, will become a most lucrative branch of trade.

12. Whether therefore we regard the whole experiment, or that portion of it relating to the exportation of flax, the results cannot but be most encouraging, and gratifying. Of the sum of 1500 Rs., all but a fraction has been repaid from the proceeds of the experiment; while the experience acquired regarding the soil best adapted for the growth of the article, the mode of its manipulation, its packing, and its transport, and finally, the practical solution of a question affecting the interests of thousands, would seem to be cheaply purchased at an expenditure of Rs. 115-3-8. It has now been experimentally proved that flax grown from country seed in the Punjab can command a first-class price in the European markets, leaving a large margin to cover cost of transport, &c., and for profit. The question may be said to have passed from the stage of speculation and surmise to

that of fact, and it only remains for private enterprise to carry on what Government has begun.

13. It only remains for me to add that the unadjusted balance of Rs. 727-8, has already been passed in contingent bills, and expunged from the Goojranwalla inefficient balance; and that the sum of Rs. 657-14-0, being the net sale proceeds due from Colonel Burnett, after deducting the expenses of agency and transport defrayed by him in England, has been duly received and credited to Government; and also to record my sense of the valuable services of Lieut.-Colonel Clarke, who originated the experiment, and by his energy and influence induced the zemindars of Goojranwalla to undertake the cultivation; of Mr. Steiner, to whose practical knowledge and superintendence the successful preparation of the fibre is to be attributed; and of Lieutenant-Colonel Burnett, to whose energetic co-operation in England, we owe, in a great measure, the financial success of the experiment. While, however, we bestow well earned commendations upon those directly concerned in these operations, it would be a great omission not to notice the services of a gentleman, whose previous exertions prepared the way for the experiment now reported on; I allude to Mr. H. Cope, of Umritsur. It was Mr. McLeod's conviction that but for his advocacy as Secretary of the Agri-Horticultural Society, and the success of his previous operations, the Goojranwalla experiment would never have been acceded to by Government.

I have &c.

(Signed,) T. H. Thornton,

*Personal Assistant, for*

*Offg. Financial Commissioner.*

*Account of Sale proceeds of Goojranwalla Flax.*

| RECEIPTS. | £. | s. | d. | £. | s. | d. |
|---|---|---|---|---|---|---|
| Sale proceeds of 19 Bales, sold at Belfast, as per account, .. .. .. | 68 | 6 | 4 | | | |
| Sale proceeds of 9 Bales, sold at Dundee, as per account, .. .. .. .. | 28 | 15 | 10 | | | |
| | | | | 92 | 2 | 2 |
| DISBURSEMENTS. | | | | | | |
| From Wuzeerabed to Mooltan, including cost of packing, &c., .. .. .. | 4 | 10 | 1 | | | |
| From Mooltan to London, .. .. | 16 | 0 | 6 | | | |
| From London to Belfast per Steamer, including ware-housing in London, commission, &c., .. .. ... .. | 4 | 15 | 0 | | | |
| From London to Belfast, including storing, commission, &c, at Belfast, .. | 3 | 18 | 2 | | | |
| For Carriage of 9 Bales to Dundee, &c., &c., .. .. .. .. .. | 1 | 12 | 9 | | | |
| | | | | 30 | 17 | 1 |
| Net Proceeds, .. | | | | £61 | 5 | 1 |

The account of expenditure up to the date of despatch from Goojranwalla will be found in the Account Current appended to Lieut.-Colonel Clarke's Report.

(Signed,) A. A. ROBERTS,
*Offg. Financial Commissioner for the Punjab.*

LAHORE:
*The 20th July,* 1859.

---

*To the* OFFICIATING FINANCIAL COMMISSIONER *for the Punjab.*

*Dated Lahore, the 13th October,* 1859.

Revenue Department.

SIR,—I am directed to acknowledge your letter No. 457, dated 20th July last, and to express the gratification which the Honorable Lieut. Governor has derived from its perusal, and from the evidence which it contains of the appreciation accorded in the markets of Belfast and Dundee to the flax grown in the Goojranwalla district of the Punjab.

2. His Honor desires cordially to acknowledge the valuable services of those gentlemen by whose exertions the capabilities of the Punjab for the profitable cultivation of flax have thus been demonstrated; of Lieutenant-Colonel Clarke, who originated the experiment, and induced the zemindars of the Goojranwallah district to undertake the cultivation; of Mr. Steiner who superintended the preparation of the fibre; of Lieutenant-Colonel Burnett, who exerted himself to introduce the product into the British market; and lastly, of Mr. Cope, for the persevering zeal with which he has always advocated the experiment.

3. Copies of the report, when printed, will be forwarded to the gentlemen above named, to the Deputy-Commissioners of Districts in the Punjab, and to the Supreme Government; also to the local and vernacular newspapers, and to the Secretaries of the Agri. and Horticultural Societies—Lahore and Calcutta.

4. I am directed to annex for your information an original letter* from Messrs. Henry Cope and Co. of Umritsur, offering to purchase, at a good price, flax which may be grown in this country.

* Dated 28th September.

I have, &c.

(Signed,) R. H. Davies,

*Secy. to Govt., Punjab.*

---

*Experimental Silk culture at Umritsur in the Punjab: By* Henry Cope, Esq.

*To the* Secretary Agri-Horticultural Society of India:—

Sir,—Permit me to say a few words with regard to the experimental silk culture undertaken by me in the early part of this year, the account of which I understand it is the intention of your Committee of Papers, to transfer from the report of your proceedings, to the more prominent section of the next number of your Journal.

It may be in the recollection of your Society that I expressed, in my former communication "On the introduction of the silk-worm into the Punjab," (vide Vol. X., of the *Journal*, page 189) my readiness to assist any one in the hill and submontane districts of this province, who might be desirous of undertaking an experiment with eggs, at the same time to purchase all the cocoons that might be reared, so that there might be no doubt as to a market for the produce of such experiment, and no risk of loss by whomsoever it might be undertaken. Mr. D. F. McLeod, Financial-Commissioner in the Punjab, who is now fully sensible of the advantages that must attend the culture of silk in the Punjab, reprinted the papers contributed by me to your Society, and published in your Journal, and gave them the advantage of official circulation in all parts of this Lieut.-Governorship.

Notwithstanding this, I regret to say that my propositions appear not to have found that favor with the district officers whom they more especially concerned, and I did not receive a single application on the subject (one from Peshawur was unfortunately too late by the time operations should commence) I therefore determined on a small attempt myself, with the advantage before me of an unlimited supply (so far as my experiment was concerned) of mulberry leaves from numerous trees planted in all directions about Umritsur, and which I had previously examined as to their quality and consideration.

The result of that attempt I have done myself the pleasure to communicate to your Society, by whom it was taken into consideration at their meeting of the 8th June. That result, and the opinions given on the cocoons I reared, have been so favorable that it is my intention as I have, I believe, already mentioned, to enter more largely on this most interesting culture during the year 1860, for which arrangements have already been made, and I hope to do myself

the pleasure of communicating its results in due course to your Institution.

I have some reason to believe that the success of my past experiment will have had the effect of rousing others from apparent apathy, and I would hear of other attempts. I only say that I shall be most happy to afford to them at the proper time, not only the required amount of silkworms' eggs, but all the information and assistance in my power; renewing at the same time, my offer to purchase merchantable cocoons from those who may be desirous of disposing of them, with the view of ensuring a market, and a fair return for those who may not have the means or the inclination to wind the silk themselves.

I have, &c.

UMRITSUR: HENRY COPE.

18*th August*, 1859.

---

(*Extract from the proceedings of the ordinary general meeting held on 8th June*, 1859.)

The subject that next engaged the attention of the Meeting related to an experiment on a small scale, recently instituted by Mr. H. Cope, at Umritsur, for the culture of the silkworm. The first communication submitted was the following letter *in extenso*, from Mr. Cope, date 24th April, to the Secretary of the Society, forwarding a small quantity of cocoons, and extract of a second letter on the same subject:—

"I do myself the honor to send for presentation at the next meeting of your Society, twenty silk cocoons out of a considerable number reared by me as an experiment only this season. They are from the annual worm, and will, I think, be considered ample evidence as to quality, appearance, and size, of the now admitted belief, that the silkworm can be successfully reared in the Punjab, not only in the submontane districts, but at a considerable distance from the foot

of the hills. I send a separate parcel containing 100 cocoons, picked at random and sun dried, which I shall be thankful by your having wound, with the view of ascertaining, as near as possible, the relative weight of the cocoons, and the silk they produce. The Afghans maintain that their worms yield 1 seer of silk out of 5 of cocoons. Should those I send be equally productive, their value will be much enhanced. You are aware that Mr. McLeod, the Financial Commissioner of the Punjab, has caused my silk papers in your journal to be reprinted for official circulation in the Punjab, and I hope the result may induce some of the officers of Government to turn their attention to this important branch of industry."

*Extract of a letter from H. Cope, Esq., dated Umritsur, 27th April,* 1859.—"Those worms that have not spun as yet are as vigorous now (27th April) as those that spun ten days ago. I have in two large beds (I rear the worms on charpoys as a temporary and convenient measure) found only one dead worm, and three that seemed unable to spin. Many of the cocoons obtained since I sent you the 120 are finer and larger than any of those, and confirm my conviction regarding the success of silkworm cultivation in the Punjab. Strange to say that, notwithstanding the valuable official countenance recently bestowed on the matter, only one district officer has evinced any desire to devote his attention to so interesting a subject. It is my full present intention to enter as largely on the cultivation next year as circumstances will permit, and very much will depend on the quantity of food that will be available."

The Secretary next read the following reports on the above cocoons from Count Freschi and Mr. C. E. Blechynden; as also a report from Mr. Turnbull, Manager of the Radnagore filatures, who had kindly undertaken to reel them into silk:—

*From Count Freschi.*—"The few cocoons that you have sent me yesterday are very beautiful, both for the shape and

colour, and if they were more *etoffés*, I should not find any difference between them and the finest of my country. Their lightness may be attributable to the worms not being so frequently supplied with food, as is required in a hot climate, because heat accelerates the life of the worms, and if they are not fed almost continually with fresh leaves, they cannot thrive, but will grow rather weak and exhausted. I fear that in the Punjab the hatching of the eggs does not take place as early as possible, *i. e.*, with the first shoot of the mulberry leaves, so that the worms, well fed, may reach the time of spinning in a still moderate temperature. The improvement of rearing, which must be the object of superior encouragement, will undoubtedly improve this fine breed, especially if it has been introduced from Kashmeer: for, indeed, I should not be so sanguine if it had come from Europe.—*Wellesley Place, 7th May* 1859."

*Extract of a letter from C. E. Blechynden, Esq., dated Chumparun, 6th May.*—"The cocoons are superior to any I have seen reared in this country. They would probably be equal to Italian, if as I suspect, the worms, at the time they were attaining maturity and about to spin, had not experienced a sudden change of temperature. I am of this opinion, from the circumstance of the coating of silk not being in keeping with the large size of the cocoon. One of the cocoons sent for my inspection is a double one: this cannot be wound off. This confirms my first impression of a sudden change in the temperature, whilst the worms were spinning. I think that one seer of 80 sicca weight of such cocoons would give from 8½ to 9 tolas of raw silk. These cocoons would seem to show that the climate where the worms were reared is very suitable for the culture of silk. It would be interesting and useful to know the system of rearing adopted by Mr. Cope, and from what stock these cocoons have been derived."

*Mr. C. S. Turnbull.*—"I have much pleasure in reporting on the 100 cocoons from the Punjab which you sent for the purpose of being reeled into silk, and asking my opinion thereon.

"The cocoons are far superior to anything of the kind to be had here. I tested and find the quantity of cocoons being 1 pun 11 cocoons to a chittack, whilst, with the boro-poloo, just double the quantity goes to the chittack, both cocoons, as a matter of course, being dried. The superiority of the former is owing, in a great measure, I should say, to the worms being fed from the leaves of the standard tree, whilst in Bengal they are fed from the shrub-mulberry, the leaves of which never have ripened sap.

"The silk obtained from 100 cocoons, weighing 5½ tolahs is 9½ annas, which is something unknown. I reeled 4 to 5 cocoons, and should say it deniers 10, which is finer by 2 deniers than any silk shipped from Bengal. The silk I send *is not reel picked,* the cocoons reeling so beautifully and cleanly. Another great advantage is that 5 chittacks of fine silk could be reeled in a day, whilst I reel 3½ chittacks. The silk I have no hesitation in saying ought to sell higher than any of the Bengal marks, with careful reeling, and not be far off the Italian silk. I consider it, I may say, to be faultless, having a good color, gloss and mellow, taking into consideration its fibre; but there is one thing wanting, it has little or no elasticity.

"I am so pleased with the cocoons that I shall feel much obliged by your procuring 100 Rupees of eggs, as I should like to see how they will thrive in Bengal, as the boro-poloo is degenerating fast.—*Ghuttal,* 16*th May,* 1859."

The Secretary stated he had lost no time in furnishing Mr. Cope with copies of Count Freschi's and Mr. Blechynden's reports, (he had subsequently sent Mr. Turnbull's,) and the following is his reply, dated 17th May, to certain questions included therein:—

"I have the pleasure to state, in reply to your questions, that the silk cocoons I sent you as a sample of a quantity reared by me, were from the celebrated Kashmeer stock. I obtained a supply, under many difficulties, last year, and I can, after the most minute enquiries from Kashmeerees, and the most careful watching, during the life of the worms reared by me, as well as during their period of existence as moths, venture to assert, that this stock is *entirely* free from any *symptoms* of disease. I have carefully studied Count Freschi's diagnosis of this disease, and consider that my previous experience of silkworm rearing, during 1854, '55, and '56, gives me some title to form an authoritative opinion on this point.

"Being much occupied, I could not devote that attention to the feeding that silkworms undoubtedly require, but my worms were amply provided for, and I agree with Mr. C. Blechynden in his view, that a sudden change in the temperature, which occurred about the time the first worms began spinning, was no doubt the cause of the cocoons not being so full as they would otherwise have been. They lacked no food, but I purposely committed, what would otherwise have been, the great mistake of depending on the natural temperature for the hatching of the eggs. I wished to see how far into the season they would live and thrive. Had the whole stock been hatched simultaneously under the effects of artificial heat, as would have been done, but for such wish, I feel assured that the result would have been still more favorable than it has been pronounced; and if I live to carry out my proposed experiment next year, I hope to show such a result as will place, beyond the possibility of a doubt, the suitableness of these and other parts of the Punjab, in point of temperature and food, to the successful rearing of the finest possible silk-worms.

"The encouragement, I have received from the favorable opinions of Count Freschi and Mr. Blechynden is great, but

hardly greater than previous experience had led me to hope for. I would mention, as a proof, of how easily the natives of this country might be led to adapt themselves to silk cultivation, if they could only be induced to undertake it, that the feeding of my stock of this year was almost entirely entrusted to, and very fairly carried out under my instructions by two of my servants, who had never seen a silkworm in their lives before this year.

"Allow me to add, that Jaffer's small establishment at Dheria has done remarkably well this season, and he talks of retaining *three seers* of eggs for next year's operations. His stock, of which I have seen large portions, is perfectly healthy, and I hope to see a new silk colony rising in that neighbourhood in the course of a few years.

"It may be as well to mention, that I attribute the beauty of the cocoons and generally the successful result of my experiment, to the excellence of the leaves obtainable here, in abundance, from the numerous *trees* about the station of Umritsur, which would afford ample nourishment on a greatly extended scale. The trees are all healthy, and the leaves, such as used to be so strongly recommended, as affording the most suitable food for the worm, by Signor Mutti, in the course of his enterprising endeavours to introduce silk into the Dekkan some thirty years ago."

The Secretary added that Mr. Buskin, (firm of Messrs. W. Moran and Co., of this city,) had valued the small skein in question, reeled by Mr. Turnbull, at from 22 to 23 shillings per pound, according to advices when the last mail left England.

---

*Memorandum of the result of the experimental growth of the "Imphee" (Sorghum saccharatum?) of Southern Africa, at Elambazar, in the Beerbhoom district; By* H. C. ERSKINE ESQ.*: with a Report on the Goor obtained therefrom, by* S. H. ROBINSON, ESQ.

A. H. BLECHYNDEN, ESQ.
*Secretary, A. and H. Society, Calcutta.*

MY DEAR SIR,—I avail myself of an opportunity to send you a muster bottle of the "Imphee" *goor*. If you should like some seed of the six kinds sent to me for trial, I shall be happy to let you have some. Annexed is a copy of a memo. forwarded through the Beerbhoom Collector to the Revenue Board, of which you can make what use you please.

Yours very truly,
H. C. ERSKINE.

ELAMBAZAR, PANEEGHUR:
10*th October*, 1859.

Towards the close of May, the six parcels of "Imphee" seed were sown in well manured soil, in drills two feet apart, and at distances of six inches. The seed did not germinate very freely, owing to its being somewhat damaged. About 130 plants were obtained; their average height being from 10 to 12 feet, it was necessary to support them, without this precaution, the gale of 26th of July would have prostrated the whole.

About the beginning of July the plants began to flower, and a fortnight or so later the seeds began to form; at this stage, with the exception of a few plants reserved for seed, the heads were broken off, to give stamina to the stalks, and assist the formation of the saccharine matter. Three and a half months after the seed was sown, that is towards

the middle of September, a discolouration and drying up of the stalks were observable, a proof the plant had attained maturity; they were then cut, and a *churkee* or common hand-mill was employed in crushing the stalks. The juice expressed was sweet, but in boiling no grain was produced in the *goor*, a result which the local native farmers attribute to the very unfavorable weather for its manufacture, it being at the time exceedingly close and cloudy.

The general impression was that the "Imphee" would not attain maturity till after the expiration of four and a half months. The experiment has proved that the period allowed was too protracted, and that in three and a half months the stalks were ready for the mill. Had the seeds been sown a month later, the cane would have been crushed towards the commencement of the cold weather, and the probability is that a temperate atmosphere would have materially assisted the granulation.

From the 130 plants, three seers of *goor* were obtained of the quality exhibited in the muster bottle.

(Signed,) H. C. Erskine.

---

*Report by* Mr. S. H. Robinson.

I return the "Imphee goor" made by Mr. Erskine. It is in the form of a thin syrup of 39° density by Beaume's saccharometer, without any traces of crystallization, and slightly fermented. The sweet flavour is peculiar, unlike either cane or date produce; but having no richness in the taste, I doubt if any sugar could be produced from it; seeing also that had there been any strength or tendency to crystallize, it would have been perceptible at its present density. In its present form, it is barely worth one rupee per maund to the distiller, that is to say the current market value of good date molasses.

Mr. Erskine's experiment was tried under disadvantages, particularly as regards the crop ripening in the rains, when the juice would necessarily be weak and watery, and the small quantity operated on, which would increase the difficulty of crystallization. If the crop were grown to ripen at any period of the dry season, so as to get the fresh juice at nine or ten degrees Beaumé, and in sufficient quantity to make at least a maund of produce, I have no doubt the experiment would be much more successful . and I think it is worth repeating, because if these grasses can be made to produce a good sugar, they would have the advantage over the ordinary cane of being so much more easily crushed in any kind of cane mill for extraction of the juice.

*October* 18*th*, 1859.

---

# Monthly Proceedings of the Society.

*(Wednesday, the 12th January 1859.)*

Baboo Peary Chand Mittra, Vice-President, in the chair.

The proceedings of the last Monthly General Meeting having been read and confirmed, the Secretary read the following letter to his address from the President —

MY DEAR SIR,—As I leave India early next month, and my official connection with the Society must then cease, may I request you to notify to the Society that fact, and to tender to them my most grateful acknowledgments of the high honor they have done me in permitting me to fill the office of their President.

(Signed) ARTHUR BULLER.

*23rd December* 1858.

The Secretary also read the following resolution of the Council on the above letter :—" The Council, in submitting this letter to the General Meeting, desire to record their regret at the resignation of Sir Arthur Buller, and to express their cordial sense of his valuable services during the period of three years, in which he has held the office of President of the Society. The Council further beg to propose that, as a slight testimonial of these services, Sir Arthur Buller be elected an Honorary Member of the Society."

*Resolved* unanimously, that the above resolution of the Council be adopted by the Meeting, and a copy forwarded to Sir Arthur Buller.

The Meeting then proceeded, in accordance with the Bye-Laws, to the election of Officers and Council for the current year, appointing Messrs. R. Blechynden and R. Lauder, Scrutineers, who reported the result to be as follows :—

*President.*—Dr. Thomas Thomson.

*Vice-Presidents.*—Mr. W. G. Rose, Baboo Gobind Chunder Sen, Mr. C. A. Cantor, and Rajah Pertaup Chunder Sing Bahadoor.

*Secretary.*—Mr. A. H. Blechynden.

*Council.*—Baboo Shib Chunder Deb, Mr. J. Church, Mr. J. Agabeg, Mr. S. P. Griffiths, Baboo Ram Gopaul Ghose, the Rev. James Long, Mr. S. H. Robinson, Mr. C. B. Wood, Mr. A. Grote, the Rev. T. A. C. Firminger, Baboo Peary Chand Mittra, and Dr. F. J. Mouat.

### *Standing Committees.*

The revision of the Standing Committees was next entered on, and the names of the following Members were added to the Committees in which

there were vacancies, namely, Messrs. H. Knowles, M. Rustomjee, R. Lauder, C. Weskins, D. B. Lindsay, J. Agabeg, Rev. T. A. C. Firminger, and Mr. B. Warwick, respectively, to the sugar, cotton, fibre, coffee, oil, nursery garden, and floricultural committees.

The Annual Report from the Council was then submitted.

*Resolved*—That the Report of the Council be received and adopted.

---

The ordinary business of the Meeting was then proceeded with, and the following gentlemen, who were proposed at the Meeting in December, were duly elected members, *viz.* :—

Messrs. C. W. Reade, M. C. S.; James Rowe; R. S. Limond; J. Gow Smith; R. Newcomen; A. Brousmichie; John Wienholt; Dr. R. H. Perkins; Roy Prosunnonarain Deb Bahadoor, and Captain F. F. Vincent.

The names of the following gentlemen were submitted as candidates for election :—

Charles S. Staig, Esq., Superintendent E. I. Coal Company, Raneegunge,—proposed by Mr. J. F. Harrison, seconded by Mr. A. K. King.

William Molloy Stewart, Esq., Dulsing Serai, Tirhoot,—proposed by Mr. W. G. Rose, seconded by Mr. C. A. Cantor.

J. Williams, Esq., Meywar Agency, Neemuch,—proposed by Captain R. M. Annesley, seconded by the Secretary.

Hunt Marriott, Esq., Calcutta,—proposed by Dr. T. Thomson, seconded by Mr. Rose.

---

The following contributions were announced :—

1. The useful plants of India. Presented by the author, Major Heber Drury, of the Madras Army.

2. A Memoir of the Rev. Dr. Wm. Carey (Founder of the Society). Presented by C. A. Cantor, Esq.

3. Memoirs of the Geological Survey of India, Vol. 1, Part 2. Presented by the Government of India.

4. Journal of the Indian Archipelago, Vol. 2, No. 4. Presented by the Government of Bengal.

5. Report of the Bombay Chamber of Commerce for the year 1857-58. Presented by the Chamber.

6. Sundry copies of Proceedings and Transactions of the Society of Arts and Sciences of Batavia. Presented by the Society.

7. A small assortment of English flower seeds. Presented by Captain H. B. Weston.

8. A specimen of the "bread fruit" of the Nicobars. Presented by R. Halfhide, Esq.

Dr. Thomson recognises this as a *Cucurbitaceous* fruit, quite distinct from the real "bread fruit" of the Nicobars, which is a *Pandanus.*

9. Some fruit of a wild nutmeg, and a few heads of "jowar," from the Andamans. Presented by C. Beadon, Esq.

10. A few kinds of seeds, &c., from China. Presented by Dr. D. J. Macgowan.

"Two species of *Cucurbita,* much used as food, that in the pod being boiled, the other fried." [These seeds are identical with the "laoo" of Bengal, *Cucurbita lagenaria,* and the "Koomra," *Cucurbita pepo.*] "Some of the 'hien' vegetable, the stalk of which is salted in large quantities as a *krout.*" [This is identical with the "chumpa nuttee" of Bengal, *Amaranthus polygamus.*] "A piece of cloth made of the bark of *Hibiscus mutabilis.* There is a finer and some coarser kinds. The cost is at the rate of three cents. for the specimen."

11. Specimen of a very large cocoanut from the Car Nicobars. Presented by M. Galsteen, Esq.

Mr. Galsteen has promised to procure a number of seedlings of this fine cocoanut for the Society's Garden.

---

## *Nursery Garden.*

A report was submitted from the Garden Committee, recommending an outlay of Rs. 380 for certain repairs to the Gardener's house, and other work: also an increase of 8 annas per month to each cooly on the establishment, in consequence of the general increase in the rate of wages to men of this class in Calcutta and its vicinity. The Committee further submit certain suggestions respecting the distribution of plants, in future, for the garden.

*Resolved*—That the report of the Committee be adopted.

The Gardener's Monthly Statement was submitted.

Mr. Manuel reports favorably of the germination of the trial assortment of English vegetable seeds, received from Messrs. Carter and Co., per *Chowringhee,* and, notwithstanding the long sea voyage to which they have been subjected, the trial result is almost as favorable as that on the collections sent by the same firm by overland route. The "early emperor pea" has proved excellent; a germination of fully 90 per cent.

The Gardener continues to report as follows:—

"In the Orchard, besides the usual varieties of fruit grafts, *viz.,* mangoes 400, peaches 500, pummelows 250, and other miscellaneous grafts and fruit trees above 1,500, a few grafts of Patna and long plums have been added to the stock. I have also added about twenty grafts of pummelows of a very superior kind of fruit obtained from another source.

"The various kinds of sugar-canes of the past season are now fit to be cut, and, therefore, can be made available to applicants, as also all kinds of tuberous-rooted plants, such as the *Dioscorea batatas*, Tenasserim and Chota Nagpore yams, a few of the New Zealand yam tubers, arrow-root and tapioca plants, and to which may be added some seeds of various kinds of fibre-yielding plants, some seeds of a species of wild dholl from Assam, known as the Nigger beans, raised from seeds presented by Mr. Grose, in May last, together with the seeds of *Holcus sorghum*, or the jowar, received from General Sir John Hearsey, and bearded paddy presented by Captain Ripley of Arracan.

"I also beg to forward some coffee seed collected from the present season's crop: these I have found to be very good, as they have germinated freely, yielding a fair average of 90 per cent., and some ears of Indian corn, raised from the imported seeds of the present year's batch from America, from Messrs. Landreth and Sons.

"In the Kitchen Garden the twenty-five kinds of English, American, and Cape pea seeds laid down during the second week of November last, in about 70,000 square feet of ground, have averaged the height of 5 feet, and the dwarf kinds from 1½ to 2 feet—and with the exception of three kinds of American and two kinds of English pea seeds, all are now freely blooming—and I fully expect to collect a good crop of peas for the present season. And I may add that, after laying out the whole extent of the Kitchen Garden with all kinds of vegetables, the following seedlings are still on hand, and can be made available, if required by members, *viz.*, all kinds of cabbages, red and white, celery, parsley, parsnip, tomato, &c., and to which may be added a few strawberry plants.

"In the Flower Garden I have a number of ornamental and useful plants of the past season's propagation, with a large number of a collection of roses, in all above 15,000 plants, now fit for distribution; and with it may be added a variety of annual seedlings, raised from the last imported batch from Messrs. Carter and Co., and whose dahlia seeds have proved to be unexceptionably good, as those laid down in the beginning of October last have not only been thriving well, but almost all the plants are now in bloom, which will enable me to judge of the quality after flowering, and all duplicates can be made available to members in due course of time."

---

The Council intimated that they had fixed on Wednesday, the 19th January, as the day for the first show of the season.

They also recommend, in reference to the subject referred to them at the last Meeting, that the usual support hitherto accorded to other Branch Institutions be granted to that of Balasore. Agreed.

For all the above presentations and communications the best thanks of the Society were accorded.

---

*(Friday, the* 11*th February* 1859.*)*

Dr. Thomas Thomson, President, in the Chair.

The proceedings of the Anniversary Meeting were read and confirmed, and the following gentlemen, who were proposed on that occasion, were elected members :—

*As an Honorary Member.*—Sir Arthur Buller.

*As Ordinary Members.*—Messrs. C. S. Staig, W. M. Stewart, J. Williams, and Hunt Marriott.

The names of the following gentlemen were submitted as candidates for election :—

Lieutenant J. Birney, Assistant Superintendent Eastern Jumna Canals,—proposed by Dr. W. Jameson, seconded by the Secretary.

C. P. A. Oman, Esq., Hatowree, Tirhoot,—proposed by Mr. J. H. Allen, seconded by Mr. W. G. Rose.

Wallace Wilmot, Esq., Civil Engineer, Punjab,—proposed by Lieut.-Colonel H. Righy, seconded by the Secretary.

William Swinhoe, Esq.,—proposed by Mr. H. H. Murdock, seconded by the Secretary.

Vernon Schalch, Esq., B. C. S., Balasore,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

Captain A. H. Campbell, commanding 8th Irregular Cavalry, Seetapore, Oude,—proposed by Captain A. Impey, seconded by the Secretary.

Elliott Angelo, Esq., Merchant, Calcutta,—proposed by Mr. George Ackland, seconded by Mr. Charles Ackland.

---

The following contributions were announced :—

1. Three more copies of a work, entitled *Notice du vert de Chine et de la teinture en vert chez les Chinois.* By Monsieur Natalis Rondot. Presented by the author.

2. Two copies of a pamphlet published by order of the Chamber of Commerce of Lyons, entitled *Concours pour la recherche du vert de Chine dans les vegetaux indigenes et exotiques.* Presented by Monsieur Rondot.

3. The Annals of Indian Administration, Part IX. By M. Townsend. Esq. Presented by the Government of Bengal.

4. Journal of the Asiatic Society of Bengal, No. 4 of 1858. Presented by the Society.

5. Several kinds of seeds, and a few specimens from Upper Assam. Presented by Captain W. H. Lowther.

6. A small quantity of seed of six varieties of the "Imphee" of South Africa *(Holcus saccharatus ?)*. Presented by Dr. Edward Balfour, in charge of the Government Central Museum, Madras.

7. A box of acorns of the cork oak *(Quercus suber)* from France. Presented by Messrs. James Carter and Co.

These acorns were sent in three different ways, in sand, sugar, and mould: the last has succeeded exceedingly well, nearly every seed having sprouted, but the result of the two former is doubtful.

8. Eighty tubers of the New Zealand yam raised in the Barrackpore Park Garden. Presented by Mr. Sharpe, Superintendent of the Park.

9. Mango stones of several fine kinds from Mooltan. Presented by Major F. E. Voyle, Deputy Commissioner, Mooltan.

10. A small quantity of seed of the Chinese green dye plants raised in France *(Rhamnus utilis* and *R. chlorophorus)*. Presented by Monsieur Natalis Rondot.

Some tubers of the Chinese yam, (red and white kinds,) and some potatoes from California stock, the produce of the Society's garden, were placed on the table: also a fine healthy plant, in excellent blossom, of *Sutherlandia frutescens*.

---

The Council reported that they had elected the following Members to their Sub-Committees :—

*Finance.*—Messrs. C. A. Cantor, Pearychand Mittra, and S. P. Griffiths.

*Papers.*—Mr. Grote, Dr. Thomson, and the Rev. J. Long.

*Correspondence.*—Messrs. W. G. Rose, A. Grote, and C. B. Wood.

The Council further reported that they had fixed on Thursday, the 24th February, as the day for the next exhibition of fruits, vegetables, and flowers.

---

*Provision of Vegetable, Flower, and Agricultural Seeds for* 1859.

Read the following report of the Garden Committee :—

"Your Committee have to report on the above subject as follows :

"*Seeds from North America of Vegetable, Cotton, Maize and Tobacco.*—These have proved very fair altogether, and the peas much better than last year. Fifty packets more will be added, *viz.* 550 altogether, and a corresponding addition of peas and beans. The usual supply of cotton and maize seed, and a small assortment of flower seeds for the Society's garden, will be also included.

"The last consignment reached very late (1st September), fully five weeks later than that of 1857, owing to the vessel (the *Coringa)* having made a very long passage. Messrs. Landreth have been apprised of this, and requested to ship the next consignment as early as possible.

"*Seeds from the Cape of Good Hope.*—These appear to have given satisfaction generally, the peas especially. The Committee accordingly recommend that the full order be given to Messrs. Villet, *viz.* for 550 packets. Strict injunctions should be given to Messrs. Villet to address the cases properly, and so prevent a repetition of the mistake which occurred with the last consignment, whereby (as reported at the October Meeting) fully three weeks' time was lost in obtaining them.

"Another trial assortment, from Mr. Upjohn of Cape Town, was received in September last, and germinated exceedingly well; the collection is fully as varied as that of Messrs. Villet, and nearly double the quantity in each parcel, but the cost is nearly three times as much; it would not therefore be advisable, the Committee think, to order a consignment from Mr. Upjohn, unless he can supply at the same rate as Messrs. Villet; unless, indeed, the produce is superior; and on this point the Committee are not yet in a position to determine.

"Another trial assortment was also received from Mr. Templeman of Cape Town, but they did not germinate so well as those of Messrs. Villet and Upjohn; moreover, though there was a larger quantity of seed in each paper, the collection was not so varied, while the charge is more than double that of Messrs. Villet. It is not, therefore, desirable, your Committee think, to order another trial consignment from that quarter.

"*Flower Seeds from England.*—The seeds received this year from Messrs. Carter and Co. have also given satisfaction, and the Committee recommend an order for 550 packets. Messrs. Carter and Co. sent last year two trial collections of vegetable seeds by overland and *vid* the Cape; the former was distributed in various parts of the country, and the report is altogether favorable; the latter, shipped on the *Chowringhee*, reached so late as the 6th December, that vessel having been nearly six months on the voyage: consequently, the Committee cannot give a comparative report on the result of each consignment. The price per packet for which Messrs. Carter can furnish these vegetable seeds is rather more than double that of Messrs. Villet, but the quantity is considerably greater, fully double.

"*Agricultural Seeds from England.*—The Committee regret to report that the seeds of field crops received from Messrs. Gibbs and Co. of London, last year, have totally failed. They therefore recommend, as suggested by the Council, that an order for next year's supply be given to Messrs. Carter and Co., to the extent of £100, and that the sum of £20 be also appropriated for obtaining wheat seed from the Cape of Good Hope.

"*Ornamental plants from England.*—Your Committee have further to recommend that four glazed cases of new roses and other new ornamental plants be obtained this year from England, to add to the stock in the Society's garden.

"In conclusion, the Committee beg to subjoin a memo. of the probable total cost of these consignments of seeds, exclusive of freight, insurance, and other charges :—

"*Memorandum.*

| | | |
|---|---|---|
| "Seeds from North America | ... | Rs. 2,600 |
| "Ditto ditto Cape of Good Hope | ... | " 1,925 |
| "Ditto ditto England (flower) | ... | " 2,200 |
| "Agricultural seeds from England and Cape | ... | " 1,200 |
| | | Rs. 7,925 |

(Signed) W. G. Rose.
" C. A. Cantor.
" Joseph Agabeg.
" S. P. Griffiths.
" T. A. C. Firminger."

It was agreed, on the recommendation of the Council, that a portion of the flower seeds from England be sent by the first steamer in August for distribution to country members, the remainder to be sent, as heretofore, by the second August steamer, for town members.

---

*Horti-Floricultural Exhibition.*

Read the following reports of the judges regarding the show of vegetables, fruits and flowers, held in the Auckland Garden, on the 19th January 1859 :—

"*Horticultural.*—The judges have the pleasure to report that the first display of vegetables and fruits of the present season was altogether as good as at any previous show, and better than many; and they desire to offer a few remarks regarding the produce exhibited.

"*Cauliflowers.*—Many baskets were exhibited of this fine vegetable, with full compact heads.

"*Scotch Kale.*—Rather poorly exhibited, only three plants from three gardens.

"*Brocoli.*—Several good varieties of well-formed and compact kinds.

"*Cabbages.*—The sugar loaf was rather scanty, Savoy well exhibited, with well-formed heads; early York and Battersea rather poor. Red Dutch kind was a decided improvement, both in its compact form and deep red color.

The large or drumhead cabbages were exceedingly good, and in large quantities.

" *Endive, blanched.*—Rather a small show, but good specimens.

" *Lettuce.*—Some very good specimens of cabbage lettuce were brought forward.

" *Nole Kole.*—Some most extraordinary-sized specimens were placed on the stands, both purple top and green, but they were too old to be of any use for the table; the smaller kinds were fine and tender, and, consequently, carried off the prize.

" *Celery.*—A few specimens of white and red kinds were exhibited, but this fine vegetable was by no means well represented, and, consequently, no medals were awarded—only money prizes.

" *Turnips.*—The American flat turnips were exhibited in large numbers. The stone turnips were of ordinary kind; but the small purple top were adjudged the best, which carried off a prize, but without medal.

" *Onions*—Were mostly such as were raised from bulbs of the past season's growth.

" *Leeks.*—The same.

" *Carrots*—Though small in quantity, were altogether of good quality; the early horn was very fine, also the long orange; but the white Belgium was rather indifferent.

" *Raddishes.*—Both white, red, and purple top were well exhibited.

" *Potatoes.*—Though not of so many varieties as usually exhibited in this season of the year, yet what were displayed were considered pretty fair. This partial falling off may be attributed to the heavy fall of rain of the 25th October. The keeping kinds formed the largest collection, and were such as to deserve attention, both for size and cultivation. Of the new varieties there were none, but some good specimens of the latest sowings were well grown. The prize was awarded only to the best keeping kind, though it was considered not of that standard as to merit a medal.

" *Peas.*—A collection of pretty fair specimens were exhibited, but not altogether equal to that of last year; the failure of this crop is likewise attributable to the heavy rains of October last, as the peas were sown shortly before the rains came. The imperial pea was pretty large and good. The Prussian blue was rather backward, but the marrowfat pretty well shown.

" *Beans.*—The only varieties exhibited were the long pod and French bean; both specimens were pretty good: a new variety of French beans, with broad pods, was placed on the stand, which was considered good.

" *Horse Raddish*—Showed a decided improvement.

" *Squash.*—Many good and well-formed specimens were exhibited, and merited the attention they received.

" *Asparagus.*—Poor, as might be expected at this season.

" *Of Native Vegetables* many good specimens were exhibited. The display of fruits was altogether good, more especially the following kinds:

" *Pomegranates.*—Very good and sweet, and full of juice.

" *Sapotas.*—Though too early for a good ripe fruit, yet the specimens were fair and good flavored.

" *Pine Apple.*—Many good specimens, and a large collection for the season.

" *Plums.*—Only the long variety was exhibited, but they were a little inferior in size and flavor.

" *Papias.*—Very good kind.

" *Bales and Guavas.*—Also very good kinds.

" *The Sugar-canes* from Mr. R. Wood's stock were very good.

" *The New Zealand Yams* from Barrackpore Park and another garden were of good size. The Tenasserim and other yams were equally good.

" There was a very fair competition, and prizes to the amount of Rs. 313 were awarded to fifty-four gardeners. About 200 were in attendance.

(Signed) W. G. Rose.
,, Pearychand Mittra.
,, T. A. C. Firminger.
,, Joseph Agabeg.

" *Floricultural.*—The collection of plants exhibited on this occasion was less than at the first show of 1858, and the competition was also less, the produce of twenty gardens only having been brought forward, of which ten received prizes to the amount of Rs. 70, as per annexed list in detail.

" There was scarcely anything calling for notice, except the collection of roses, which somewhat redeemed the character of an otherwise poor show. The display of these favorite plants was greater than at any previous exhibition. About eighty were submitted from twelve gardens, in which were included three or four new kinds, one in particular, named *Souvenir d'un ami*, (which carried off the prize for the best specimen of a new rose in pot,) was an exceedingly well-grown example.

" Two good collections of plants were sent from the Botanic garden and the Society's garden, for exhibition only, not for competition.

" The judges think it would be desirable to offer in future, as in former years, more prizes for verbenas and portulacas, in order to add to the beauty and interest of the show.

" The concourse of visitors was great, fully equal to, if not exceeding that at any previous show.

" The judges further conceive that the best acknowledgments of the Society are due to the Calcutta Infantry Volunteer Guards for the services of their band, also to Captain G. E. Voyle, Commissary of Ordnance, for the

loan of tents, and to the Reverend J. Ogilvie of the Free Church Institution and Messrs. Burn and Co., for the loan of benches, &c.

(Signed) THOMAS THOMSON.
" S. P. GRIFFITHS.
" J. SCOTT ELLIOT.
" R. WARWICK."

---

*Nursery Garden.*

The gardener's monthly report was read. After alluding to several contributions during the past month, Mr. Manuel refers to the seeds received from the Botanic garden at Adelaide, in February 1858. He states that the *Kennedya rubicunda* and *Sutherlandia frutescens* have been in flower during the present season, and sends a specimen of the latter :—

"In the orchard I am glad to report that almost all the fruit grafts have come into bloom, especially the avacado pear, mango, litchees and peaches, which have thrown out their blossoms profusely. If the present heavy fogs do not in any way tend to injure them, a better crop than that of the past year may be fully expected, particularly of the avacado pears, of which many trees, which had received injury by the gale of October last, are in bloom now. As to peach trees, they appear in full bloom, and very healthy and vigorous, and I expect the present crop, consequently, will be much better than the last.

"In the Kitchen Garden every available space has been laid out with vegetable and other useful produce. The California potato, received from Captain White, of the Steamer *Lightning,* reserved from the produce of the past year's sowing, were laid out immediately after the end of the rains, but the heavy rain of 25th October last upset all previous preparation of plots, and the seeds were of necessity taken up for a second sowing, as the plots were quite covered with water, which tended to injure many of them; however, such as were secured, were re-sown, and I am happy to forward forty potatoes as specimen for inspection, which weigh 9 pounds on an average of four and a half potatoes to a pound. The produce taken up from a small spot has yielded 8 seers, and on this reckoning I expect that the land to the extent of a quarter beegah will yield nearly a maund and a quarter or more of potatoes, which I consider a fair average produce.

"I also consider this potato, not only for its size, but for its keeping, a good specimen of a potato, and therefore deserving every encouragement to propagate as freely as can be done. I think this potato to be as fine, if not finer, than any raised in Bengal.

"I also beg to forward the specimens of *Dioscorea batatas,* both white and red, received from China from Mr. Fortune. These yams were laid down in

the beginning of May last, when they were in size like the ordinary size long plums, and I must say they have much improved. All I now send may be distributed to any members requiring them, and what I will again dig up I shall reserve for distribution to those members whose names are already registered.

"In March last a case of plants was received from Captain Ripley, in which were eight potatoes, as No. 8, known in Arracan as *Shan* potato; these were put down, and I find them to be the *Batatas leucorrhiza*, or *suffed suckerkund aloo.*

"All the cotton plants in the three plots have been pruned since the beginning of the year, and every plant has thrown out new and vigorous shoots. As an experiment, two plots are put under irrigation, and the third is left unirrigated: those under irrigation are much in advance of the non-irrigated, and the plants are altogether more healthy.

"I may add, in conclusion, that upwards of 3,000 sugar-canes are now fit for cutting, and it would be desirable that persons in want of them should apply soon for such varieties as the striped Bourbon, Singapore, Mauritius, and Otaheite."

---

*Communications on various subjects.*

The following papers were likewise submitted :—

1. From Captain W. H. Lowther, two communications from Upper Assam, dated 29th December and 19th January, respecting the seeds, &c., already alluded to, and on other subjects.

2. From James Cowell, Esq., Marseilles, dated 16th December, intimating that his agents have been unable to forward overland the madder seed alluded to in his previous communication (submitted at the December meeting), in consequence of the large amount demanded for freight; and that he has, in consequence, taken steps for its despatch by a sailing vessel *viâ* the Cape, having been informed, on good authority, that the seed will retain its germinating power for two years.

3. From R. Sturrock, Esq., Secretary Chamber of Commerce, Dundee, dated 9th December, enclosing copy of the proceedings of a recent meeting of the Chamber in connection with the produce of flax in the Punjab, and requesting information as to the best practical mode of promoting the growth of the staple in India as speedily as possible.

*Resolved*—On the recommendation of the Council, that a *Special* Committee, consisting of Messrs. W. G. Rose, S. H. Robinson, and the Reverend T. A. C. Firminger, be requested to consider and report on this subject.

4. From Baboo Gour Doss Bysack, Secretary Branch Agricultural and Horticultural Society, Balasore, returning thanks for the offer of assistance

from the Parent Society: applying for information regarding seeds, and for copies of the publications of the Society.

*Resolved*—That copies of such publications as may be available be forwarded.

5. From W. H. Pringle, Esq., Manager Rajharra Colliery, applying, on behalf of the zemindar of Rajharra, who is most desirous of introducing foreign kinds,—for a quantity of American cotton seed, for trial in his zemindaree, and promising to communicate the result in due course.

*Resolved*—That this application be complied with.

For all the above communications and presentations the best thanks of the Society were accorded.

---

*(Wednesday, the 16th March 1859.)*

Dr. Thomas Thomson, President, in the Chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen were elected Members:—Lieut. J. Birney; Capt. A. H. Campbell; Messrs. C. P. A. Oman, Wallace Wilmot, William Swinhoe, Vernon Schalch, and Elliott Angelo.

The names of the following gentlemen were submitted as candidates for election:—

C. S. Turnbull, Esq., Silk Manufacturer, Ghotal,—proposed by Mr. S. H. Robinson, seconded by the Rev. T. A. C. Firminger.

William Harvey, Esq., Civil Engineer, Indore,—proposed by Sir Robert Hamilton, seconded by Mr. C. A. Cantor.

G. T. B. Kemp, Esq., Deputy Magistrate, Chittagong,—proposed by Mr. T. P. Larkins, seconded by the Secretary.

W. S. Seton-karr, Esq., Civil Service, Jessore,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

H. P. Onslow, Esq., Collector of Bassein,—proposed by Mr. J. F. Galiffe, seconded by the Secretary.

E. Hudson, Esq., E. I. Railway,—proposed by Mr. T. H. Bennett, seconded by Mr. W. G. Rose.

The Secretary Local Fund Committee, Umritsur,—proposed by the Secretary, seconded by Mr. W. G. Rose.

---

The following contributions were announced:—

1. Watson's Principles and Rudiments of Botany. Presented by the author.

2. The Cotton Supply Reporter, Nos. 5 to 9. Presented by the Manchester Cotton Supply Association.

3. Selections from the Records of the Government of Bengal, No. 29. Presented by the Government.

4. Journal of the Asiatic Society of Bengal, No. 6 of 1857. Presented by the Society.

5. Two grafts of apple and pears from Dorunda. Presented by Dr. C. F. Warneford.

The fruit from the trees from which the above grafts have been taken were previously sent by Dr. Warneford, and considered of good quality.

6. A few bulbs of a very large jungly creeper found near the Fort of Belitai, in Oude. Presented by Lieutenant Robert Shebbeare.

Lieutenant Shebbeare mentions that these bulbs are said by the natives to be good eating while young, but to possess intoxicating qualities when old. Some of the bulbs are very large, weighing about 14 seers.

The Secretary stated that one of these bulbs had been sown in the garden, with the view of determining the name of the plant.

7. Sundry seeds and tubers from Upper Assam. Presented by Captain W. H. Lowther.

The following is extract of Captain Lowther's letter, dated Suddiya, 6th February, respecting some of these seeds :—

" I lose no time in sending you two tubers of that handsome edible cucumber (of which you received seeds), *i. e.* because the Assamese tell me that really good kind for the table is alone to be ensured by these means, and that *seed* is not to be trusted. Also, I send tubers of a very pretty fragrant little orchid (white) common in our low marshy grass plains.

" Seed of a pulse used much by the frontier savages, and suited to your Bengal cultivation,—also sending other seeds to fill up the little box.

" We have had heavy rain, and my wheat is really splendid for a Bengal crop, more than 5 feet high, full in ear. I believe this is the most N. E. point of Her Majesty's Indian Territory in which it has ever been grown. Most of your maize, too, is above ground, but as I wrote you the other seeds have arrived too late.

" The '*Hulluck*' and other perishable seeds I of course transmit per letter.

" *Hulluck* of Assam is a '*Terminalia*' of fine, tall, straight, durable timber growth : for common carpentry excellent, and even as a canoe, lasting five years, or more. Lovely when in blossom ; one mass of deep rose, or carmine red tiny flowers ;—no larger than these seeds,—grows in the vicinity of the great rivers on alluvial soil,—chiefly composed of sand and vegetable deposit. Forests with a dense under-growth seem necessary to its primary increase, and then it speedily overtops and overshadows every thing in its vicinity ; ought to do in the greater part of Bengal,—and if not too near the sea.

" The large creeper, *Tenga gootee*, looks like a *Smilax*, but not having seen it in flower I cannot speak with certainty ; grows on the edges of forest

streams, clinging to the bank reeds, or grasses; berries used throughout Assam as the natural bait for the better kinds of fish, which seem in those localities of its growth to care for little else. I have a number of magnificent terrestrial orchids (3 or 4 feet high,) planted ready for you: these superb plants are only to be found in the most dark and unhealthy forests, and I have therefore availed myself of this dry, healthy period to collect them. You will certainly have to make a jungle in some wet, dark corner of those picturesque gardens to meet the *shy* nature of many of my donations."

8. A quantity of Darjeeling munjeet seed. Presented by Dr. A. Campbell.

---

*Horti-Floricultural Exhibition.*

The following report of the judges on the second show of vegetables, fruits and flowers, held in the Auckland Garden, on the 24th February, was submitted:—

"*Horticultural.*—In submitting the following report the judges have the pleasure to observe that this show was fully equal, if not superior, to the second show of 1858.

"*Cauliflowers.*—A very few fair specimens from four native gardens, though the season may be considered well advanced for this vegetable; these had well formed heads, full and compact.

"*Scotch Kale.*—Superior specimens to those at the last show from five gardens; the competition was spirited; one lot, for which the highest prize was given, was very superior to the others, to which equal prizes were awarded.

"*Brocoli.*—Very fair specimens in pretty large numbers.

"*Cabbages.*—The sugar loaf was still poor; Savoy, Battersea and early York were all nearly as good as those last exhibited. The red pickling cabbages were excellent, with fine round heads and dark or deep red color. Both kinds, the red Dutch, with large heads, and the dwarf red, were in many baskets. The drumheads were of exceedingly large size and fine heads; a better show than the last.

"*Endives, blanched.*—A better show than the last.

"*Lettuces.*—Both cabbage and cos well blanched, and, though few in number, were better than at the January show.

"*Celery.*—Both white and red were very largely exhibited and superior to those at the last show, perfectly solid, firm and crisp; in size full 30 inches in length, and the roots measuring fully 5 to 6 inches.

"*Spinach.*—Only from one garden, of the prickly variety, with healthy vigorous development of leaves, well exhibited, in a large basket.

" *Nole Kole.*—Both green and purple top, though large in size, but much advanced in season, some smaller sized were found more tender and better flavored.

" *Turnips.*—Some of very large size in large baskets were well displayed of both white green and purple top, quite equal to those previously exhibited. The Sweede turnips were much better, and the field crop was of exceedingly large size.

" *Onions and Leeks.*—Similar as the last show, with no improvement.

" *Carrots.*—Of three varieties, the long orange, the early horn and white Belgium; all were equally good, with fine large succulent roots, and of good flavor.

" *Beet.*—Both long blood and turnip-rooted were largely exhibited, and of a good variety, of moderate size; root with deep red all through and small leaves of deep red color. The whole were superior to the January specimens.

" *Raddish.*—Nearly as good as the last, though much out of season.

" *Potatoes.*—Much better exhibited than the last, and in larger number, both in quantity and variety, with very great improvement. The California potato was also exhibited. This variety is of a superior kind, being very prolific and of a very large size, very mealy and fine flavored, as also a good keeping kind; but to the kidney-shaped potato, known as a good keeping kind, was adjudged the first prize.

" *Beans*—Were not better than at the last show, though the American long pod beans were exhibited in abundance; the common French bean was equally good.

" *Peas.*—Though late in season, still what were exhibited were very fair specimens. Both the Imperial and Prussian blue peas were very good—the marrowfat, though large in quantity, was rather inferior in quality. The Cape marrowfat and sugar peas were very good.

" *Squash.*—A large number in quantity, but in size and quality as the last. The culture of this useful vegetable appears to be increasing.

" *Artichoke.*—For the globe artichoke the season is rather early, still it was well exhibited, with good heads and well-formed scales. There was also a very small quantity of Jerusalem artichokes, but with very inferior bulbs.

" *Parsnips and Horse Raddish.*—The same as at the last show.

" *Scorzonera.*—This vegetable may be considered as still neglected, as a few and very poor specimens were exhibited.

" *Asparagus.*—Well represented, considering the season.

" *Rhubarb.*—A specimen of this excellent plant was exhibited, it is believed, for the first time, from the garden of Mr. Marks, and for its rarity a reward of eight Rupees was awarded to that gentleman's mallee. Two other, but not equally good, specimens were likewise submitted for competition.

"Among the fruits some specimens of raspberry and strawberry were submitted from the Society's Garden and from Mr. Stalkartt at Ghooseree; and from the native gardens the following kinds were well exhibited :—

" *Limes and Lemons.*—Very good specimens for this season of the year, well flavored and very juicy.

" *Water Melon, Pomegranate and Pine-apples.*—All rather indifferent, but good for the present season.

" *Loquots.*—There were two very good specimens of superior kinds. The white is considered as a stock from China, sweet, juicy, and well flavored, was considered the best. The orange kind was equally good, but more seeded.

" *Sapotas.*—Some exceedingly large-sized and well flavored, and of superior kind.

" *Bale.*—A large quantity in number and in quality equal to the last. Fruit exceedingly large.

" *Oranges.*—Some really good country grown China oranges from stocks originally from China—which were well flavored and juicy, but smaller than the Sylhet oranges.

" *Plantains.*—Rather poor and indifferent, attributable much to injury received from the last October gale.

" Of the native greens and vegetables and herbs some very good specimens were exhibited, amongst which the most conspicuous were the variety and collection of Nepal capsicums, the Indian corn with large and full-sized cobbs, as also sugar-canes, and several kinds of yams.

" The competition was good; about 150 gardeners were present, and prizes amounting to Rs. 267 were awarded to fifty-six, as per annexed list.

" W. G. Rose.
" Joseph Agabeg.
" Peary Chand Mittra.
" T. A. C. Firminger."

---

" *Floricultural.*—The second show of 1858, it was remarked, was about the best that had ever been held in the Auckland Garden. The present show, though not equal to it, was tolerably good. The competition was pretty fair; the produce of thirty-one gardens was submitted, and prizes amounting to Rs. 136 were awarded to twenty gardeners, as per annexed list.

" The display of German asters on this occasion was very fair, and additional prizes were given for them : there could not have been less than one hundred plants exhibited from eight or nine gardens.

" The collection of roses was good, though not equal to the January show.

" A very few orchids were shown, it being rather too early in the season for the majority of this beautiful class of plants.

"There was a larger display of verbenas, portulacas and phloxes than at the last show, but no new varieties in the collections.

"Some exceedingly well grown examples of *Franciscea latifolia* were placed on the stands, also two plants of *Gladiolus* and some good specimens of *Campanulas;* the latter have not hitherto been so well exhibited.

"The collection of annuals was not so great as at the second show of 1858, but there was a novelty in the shape of *Acroclinium roseum.* The only other novelty was a plant of *Rhipsalis.*

"A collection of aquatic plants (cut specimens), including a *Victoria regia,* was displayed on this occasion from the Barrackpore Park Garden.

"Collections of plants from the Botanic Garden and the Society's Garden were likewise introduced for exhibition only, not for competition. In the collection from the Botanic Garden, consisting of flowering plants, plants with variegated foliage, evergreens, &c., were a few cut specimens of novelties, including *Brownea coccinea, Combretum Pinceanum, C. macrophyllum* and *Securidaca virgata.* Among the cut specimens of roses from the Society's Garden came the 'Geant de Bataille,' 'Duc de Nemours,' 'Baron Prevost,' 'Eugene Beauharnois,' and a few others; and from a private garden were cut specimens of the 'Lady Campbell Rose,' 'Madame Trudeau,' 'Baron Hallez,' and two or three other newly imported sorts, for which a prize was given.

"The judges have again to bring to the notice of the Society the kindness of the Calcutta Volunteer Infantry Guards in allowing the services of their Band, and of Capt. G. E. Voyle, Commissary of Ordnance, for the use of tents, and Messrs. Burn and Co. and the Principal of the Doveton College for the loan of forms, &c.

"The prizes were distributed by Mr. W. G. Rose, Vice-President.

"J. Scott Elliot.
"B. Warwick.
"S. P. Griffiths."

*Nursery Garden.*

The Gardener's Monthly Report was submitted, of which the following are extracts:—

"In continuation of my monthly report, I beg to state that I have received the following contributions during the past month:—

"From Mr. R. S. Halfhide six kinds of seeds of rarer sorts, among which is the *Araucaria imbricata;* from Captain Lowther twelve kinds of seeds of vegetables, cereals, and pulse, and tubers of *Cissampelos* and *Curcuma;* from Mr. James Cowell some seed of large pumpkins, and huge flat raddishes; from Monsieur Rondot two kinds of seeds of green dye plants; from

Dr. Campbell seeds of munjeet; and four fine healthy plants of Bombay mangoe grafts from Mr. W. J. Judge; also six kinds of imphee seeds from Dr. Balfour of Madras.

"All the above seeds have been laid down both in trial gumlows and open beds in the kitchen garden. Of the seeds from Captain Lowther, the vegetables, cereals, and pulse have freely germinated, averaging about 75 per cent. Mr. James Cowell's pumpkin seeds have also freely germinated, as well as the raddish, the former yielding an average of 80 per cent., and the latter 90 per cent.

"I beg to send enclosed a tabular statement, showing the result of the Australian seeds received from Mr. R. Scott, and of the imphee seeds received from Dr. Balfour of Madras: both results are very satisfactory.

"In the Flower Garden there have been in bloom some fine specimens of orchids, of which the accompanying specimen of *Cymbidium Mastersi*, and a new variety of *Dendrodium spirirorum* received from Sydney, through Captain Ledbetter, and which is in bloom for the first time; as also a new variety of marigold, of which seeds were received from Captain H. B. Weston in November last. All of which I send for inspection. The *Brexia heretophylla* is likewise in bloom for the first time. The *Franciscea latifolia*, a plant forming a perfect bush, with fine broad evergreen leaves, and of about 5 feet in height, has been in flower most profusely, and is highly ornamental; at the same time imparting a sweet scent highly odoriferous. All the roses in the rosery and in borders, pruned during the last season and manured, have been blooming most freely.

"In the orchard the Avacado pears are laden with flowers, as also the litchees and peaches, but the mangoes have signally failed, as almost all the blossom has withered off, whilst each tree has started with fresh vigor and full foliage. The vanilla plants are again throwing out large number of flowering spikes. The China loquot, from Mr. Emerson, has fruited well this season, that is as much as can be expected from such young plants. The pine-apples of every kind are showing large number of flowering heads.

"In the Economical Garden a third crop of the American maize may be expected very soon, whilst the several kinds of yams, arrow-root, and other tuberous-rooted plants have been dug out and freely distributed; others have been re-set for the coming season. The demand for arrow-root tubers during the present season has been unusually great.

"The Sorghum of the past year, received from Sir J. Hearsey, was cut down after the heads were taken to gather the seeds, but they are now throwing new shoots, which have not only sprouted well but are growing vigorously.

"The pea crop has fully realised my anticipation; the whole crop was very prolific, and has yielded a good return, and no doubt it would have been

greater if it had been made a marketable article in its green state; but being allowed to grow into seed before it became fit to be reaped and gathered, the late heavy and continuous rains tended to injure the whole crop most seriously, especially the dwarf growing kinds. I calculate that we shall now gather not more than 18 maunds instead of about 23 maunds, as originally estimated, from the 4 maunds of seeds that were sown.

"The following will give some idea of the descriptions of peas cultivated during the past season:—

"*American Royal Dwarf Marrow Pea.*—Sown 1st November 1858, in bloom 26th December, fit for use 25th January; height—24 inches; rather weak in habit, and requires support; average of five pea in a pod, and six or eight pods on the stem; sweet and very tasty.

"*Prussian Blue.*—Sown 1st November 1858, in bloom 2nd January 1859, fit for use 1[illegible] February; height—6 feet; fine, healthy, and vigorous in habit, requiring strong support; color—deep dark green; ripe seeds fine light blue; average seven in a pod, and eight or nine on the stem; flavor—sweet and very tasty.

"*Imperial Blue.*—Sown 1st November, in bloom 3rd January, fit for use 2nd February; remarks the same as the Prussian blue, except to color, which is still darker, and pod larger in size, with full large-sized pea.

"*American Black-eyed Marrowfat Pea.*—Sown 1st November, in bloom 28th December, fit for use 26th January; height—4½ feet; very strong and robust, very prolific, requires a good support; average pea six in a pod, six to eight pods on the stem, has a fine black spot on the eye, and fine large-sized pea; sweet and tasty.

"*Cape Large Marrowfat Pea.*—Sown 2nd November, in bloom 1st January, fit for use 1st February; height—6 feet; very strong and robust, very prolific, requires a good support; average pea six in a pod, six to eight pods on the stem; has a good flavor and sweet.

"*Cape Imperial Blue.*—Sown 4th November, in bloom 2nd January, fit for use 4th February; height—6 feet; strong and robust; a good seed bearer, but deficient in color; very sweet and tasty; six to a pod, six and seven on the stem.

"*Gibbs and Sons' Aupergne* (English).—Sown 8th November, in bloom 6th January, fit for use 1st February; usual height—4 feet; with vigorous habit, and good seed bearer; five in a pod, five to six on the stem; very sweet and tasty.

"*Gibbs and Sons' Woodford's Green Marrow Pea.*—Sown 8th November, in bloom 29th December, fit for use 1st February; height—4 feet; with vigorous habit, and appears a good seed bearer; six and seven in a pod, and six on the stem.

"*Gibbs and Sons' Ringwood's Marrow.*—Sown 8th November, in bloom 2nd January, fit for use 1st February; height—4 to 4½ feet; a good bearer; five or six in pod, and six on the stem; very sweet and very tasty.

"In the Kitchen Garden, amongst the vegetables sown, the Cape celery for the first time has come into bloom, and yielded a small quantity of seed, which I beg to forward for inspection. The Cape early York cabbage has just come to bloom."

*Cultivation and Manufacture of Flax in India.*

Read the report of the Committee specially appointed at the last Meeting to report on the above subject :—

"The undersigned were appointed members of a *Special* Committee at the last Monthly Meeting, for the purpose of considering and reporting on the subject noted in the margin.

"Read a letter from R. Sturrock, Esq., Secretary, Chamber of Commerce, Dundee, dated 9th December 1858, enclosing copy of the proceedings of a Meeting of the Chamber, held on the 29th September, in connection with the produce of Flax in the Punjab, and requesting information as to the best practicable mode of promoting the growth of the staple in India as speedily as possible.

"(Extract from the proceedings of a Monthly General Meeting of the Agricultural and Horticultural Society of India, held on the 11th February 1859.)"

"Your Committee, having given the subject due consideration, now beg to report as follows:

"They would premise that the point in question, namely, the promotion of flax culture in Hindustan, has several times come under the consideration of the Society, as a reference to its transactions and journal during the last twenty years will testify.

"In the year 1840 the trustees of the 'London Flax Company,' in India, placed themselves in communication with the Society on this subject, and a Committee was appointed to report thereon. The report of this Committee, with various explanatory documents, their recommendation for assistance from Government, and the unfavorable reply thereto, are recorded in full in the *Transactions of the Society, Vol. VIII.*

"The subject was renewed in the following year on receipt of a letter from Government, dated 12th July 1841, in which the Society was requested, in consequence of a communication from the Court of Directors, to assist the Government 'in determining on the measures proper to be adopted for improving the cultivation of flax, by supplying such accurate detailed information as they (the Society) may possess, or as they may be able to obtain, regarding the present state and prospect of flax cultivation in the provinces under the Bengal and Agra Governments, together with such suggestions as

may occur to the Society as proper to be before the Government at the time of considering the information thus to be furnished.'

"The same Committee, by desire of the Society, re-entered into the question, reiterated what had been done the previous year, and submitted with their report a mass of interesting documents bearing on the subject, all which will be found recorded in full in the proceedings of the Society for November 1841. The Committee observe that these documents 'both strengthen expectation and encourage perseverance;' and that from the details furnished, 'it is deducible that in no one instance does it appear that any doubt exists on the minds of the parties concerned of the excellence of the soil and climate of the provinces of Bengal and the Doab, for the production of flax, and every analogy goes to strengthen the belief that the North-Western Provinces generally, where the plant is everywhere extensively grown for its seed, is equally eligible for the growth of the plant for its fibre.'. Still the Committee considered, for the reasons given at the close of their report, that Government countenance and support should be accorded to the undertaking, but in a somewhat different manner to that suggested in their previous report, *viz.* that instead of a specified sum of money only, as there stated to be given under certain conditions, that the Government should import large quantities of foreign seed, and 'that a money premium be offered for a certain term of years in the same manner as bounties formerly were offered in support of new and hazardous enterprizes. That the encouragement, in short, of the experiment, should be distinctly recognised as a Government undertaking, and one in which it takes a lively interest.'

"The reply to this second recommendation was also unfavorable. It was stated that a copy of the Secretary's letter should be transmitted to England for the information of the Court of Directors. 'The cultivation of flax,' the letter goes on to state, 'can no longer be considered a doubtful experiment, since it appears from your report to have proved in many instances successful; and where successful to be very profitable. His Lordship in Council is therefore much inclined to doubt whether any bounty or reward from Government is necessary, or would be justifiable, for the support of this undertaking.'

"Since that time to the present the Society have had no further communication with Government on the subject.

"In the year 1844 Mr. John Wallace (whose name is frequently mentioned in the documents appended to the two previous reports) brought to the notice of the Society that, after several years' labors, with a view to establish flax cultivation at Monghyr, and after having taught the art of dressing the article to many parties, he would be compelled to abandon the speculation,

unless the Government gave some encouragement, and he therefore requested the assistance of the Society in bringing this fact to the notice of the authorities; but the report of the Committee being unfavorable to another appeal to Government, the subject was dropped.

"From that period to the present the Society have occasionally received samples of flax raised from foreign and country seed, in Upper and Lower India, on which both favorable and unfavorable reports have been submitted. On certain samples raised in Bengal and the North-Western Provinces, from Riga and Dutch seed, imported by the Society during 1856-57, the reports have been altogether encouraging as respects quality, but the Society have, it would appear, no reliable data before them, in connection with these specimens, to warrant your present Committee arriving at any definite conclusion in respect to the cost of culture and the return of produce.

"Coming now to the subject more immediately before them, namely, the best practicable mode of promoting the growth of flax in India as speedily as possible, your Committee beg to observe that, since their appointment, the Secretary has received and laid before them a printed copy of further proceedings of the Dundee Chamber of Commerce, at a meeting held on the 5th January, in which they find some of the suggestions they intended offering have been embodied in the remarks of the Chairman and other speakers at that meeting, but they, nevertheless, think it desirable to introduce them in this report in another shape.

"To afford any hope of success, your Committee are of opinion that the cultivation and manufacture of flax, whether in the Punjab or other parts of India, must, in the first instance, be carried out under European supervision, as the raising of the plant for fibre is unknown to the natives, and the manipulation requires much nicety and judgment.

"Impressed with this conviction, your Committee are of opinion that the proposed Flax Supply Association might materially aid the cause at the outset.

"*First.*—By sending large samples (not less than one cwt. of each) of different qualities of flax, with the market value of each sample affixed, to be distributed to intending cultivators for imitation.

"*Second.*—By undertaking to receive from independent cultivators a certain quantity of flax per annum at a liberal fixed price, for qualities corresponding with their samples as sent out, the Association could appoint agents at Kurrachee, Bombay and Calcutta, to receive the parcels as delivered there for immediate cash payment, and to ship the same to them on their own account, which would act as a much greater inducement to the planter, than by leaving him the trouble and risk of shipping it home, or the expense of

doing so through his agents, with the attendant delay in ascertaining the result of his exertions.

"*Third.*—By sending a certain number of sets of the machinery necessary for preparing the fibre, to be purchased at the lowest cost price by independent cultivators.

"*Fourth.*—By engaging and sending out to India, under engagement for one, two or three years, persons who are well acquainted with the mode of cultivating and preparing flax after the most recent improved methods, provided their services were required by the cultivators.

"The Society might also assist in this movement—

"*First.*—By publishing in English, Bengali, and Oordoo, a Manual of Instructions for growing and preparing the fibre, similar to that published in 1839 by the 'Flax Experimental Association,' but with fuller information and description of the improved processes, and

"*Secondly.*—By offering prizes for the production of good samples in sufficient quantities for working up by the home linen manufacturers.

"It would be very desirable, the Committee conceive, to endeavor to encourage the production of the best kinds of flax by Indigo, Silk and other European planters throughout the country, experimentally at first, and afterwards in quantities sufficient for export, when they had ascertained, practically, the quality required, and that the cost of production left sufficient margin for profit.

"Your Committee would propose, in conclusion, that if it be deemed desirable to forward a copy of this report to the Dundee Chamber of Commerce, a copy of the publications of the Society above alluded to be sent at the same time.

"THOS. A. C. FIRMINGER.
"S. H. ROBINSON.
"W. G. ROSE.

"*Calcutta,* 10*th March* 1859."

*Resolved*—That the above report be adopted, and a copy forwarded by the next mail to the Dundee Chamber of Commerce, together with a copy of the publications therein referred to. Further, that the same Committee be requested to undertake the preparation of the proposed Manual.

---

*Disease in the Annual Silk-worm of Bengal.*

The communication next submitted to the Meeting was a paper which the Secretary stated he had just received from the Count Gheraldo Freschi in connection with the object of his mission to the East.

The President having previously introduced to the Members present the Count Freschi and his friend Barone Cavaliere de Perfetti, the Secretary proceeded to read the following statement :—

"GENTLEMEN,—Most of you are, no doubt, acquainted with the fact that, about a month ago, two Italian gentlemen were proceeding to Asia, strongly recommended to the countenance of the English and French Governments by the Archduke Ferdinand Maximilian of Austria, Governor-General of Venetian Lombardy, with the view of making an attempt for renewing the breed of silk-worms in Europe, by the introduction of good eggs from such regions where silk-worms may be found free from the disease that has prevailed for ten years among the silk-worms of Italy and other parts of Europe, and which threatens their total extinction.

"On my way to China, whereto my partner Count Castellani has preceded me, I was desirous to visit India, to see the annual silk-worm cultivated in Bengal, and to obtain some information regarding the various species of silk-worms indigenous to India. Shortly after my arrival in this city I commenced my researches, and have now the pleasure to inform you of the results. I feel it as a duty, and pray you to accept it as a pledge of estimation and sympathy, that a President of an Italian Agricultural Society offers to the Agricultural Society of India.

"I preferred to visit the districts of Radnagore and Hurripaul as the most productive. When stopping at Ghattal I enjoyed the hospitality of Mr. Turnbull, the clever director of the great filature belonging to Messrs. Jardine Skinner and Co. From that place I was enabled to make several excursions, and visit many of those mud-built and straw-roofed rearing houses, wherein the annual silk-worms were found at different stages, partly at the third stage of their life, partly at the last, or near the time of spinning, while some were hatching; such an irregularity of hatching that is unluckily become usual in Europe for these ten years. This struck me at once with a sad suspicion that soon became a dreadful certainty. I had scarcely looked at a mat crammed with worms, before I saw some of the characteristic symptoms which reveal in our country the prevailing epidemic, *i. e.*, black spots, or rather scabs, upon the wings and legs of the insect, whose tail is frequently clipped and black as if scorched; moreover, an abnormous dung of loose green indigested matter, and a great dullness and tardiness of the worm in beginning its work; the very symptoms by which every common silk-rearer in Europe observes this fatal diagnostic according to his sad experience.

"Had I read in time a kind report which appeared in *The Indian Field* of 19th February, concerning my mission to India, I certainly should not have thought of looking for good cocoons in Bengal; but I had already com-

menced my researches, and the perusal of this journal did but assure me that it was not a dream, or a night-mare that I had met with. The writer thinks that the whole crop of the mulberry silk-worm of Bengal has degenerated, and is annually deteriorating, and that eggs imported into Europe from such crops may probably rather tend to weaken than improve the Europe breed. He says :"—Various causes may be assigned for this degeneracy into which he cannot at present enter; but he understands that the quality of the bulk of the raw silk exported at the present day is not equal to that of former years, before the East India Company sold their filatures.

"The fact of degeneracy is actually incontestable, but the disease, if perhaps not so virulent as in Europe, is certainly of the same nature. Degeneracy and disease are likewise progressing simultaneously in Europe; but whether the disease may be the cause of the former, or degeneracy a predisposition to the disease, are questions not easy to be decided. Perhaps this degeneracy may be attributable to the very unnatural treatment of the worms adopted in Bengal, namely, exclusion of light, scarcity of food, and want of perfect ventilation of the rearing rooms; but such is not the case in Italy and France, where worms are generally well fed and carefully kept in capacious and clear well ventilated houses; and, nevertheless, they are everywhere sick and degenerated.

"I was the first in Europe who dared advance the opinion, that silk-worms, wherever introduced, and living, to say so, artificially, will wear out and require renewal. The condition of the mulberry silk-worm in Bengal, which is not its natural country, affords an additional weight to my opinion. What if I dare say that sooner or later the same disease will break out in Persia and elsewhere? But I hope I may be mistaken; and luckily that is very possible. We endeavor to speculate on nature, but we can neither penetrate the veil that conceals her, nor sound the abysses of her arcana.

"Now, gentlemen, I don't know if your monthly species of mulberry silk-worms, the *Dessee* and *Madrassee*, as you call them, are really indigenous to India and free from the prevailing epidemic. I have not yet been able to see them, and perhaps I shall not before my departure to China. Besides, I scarcely need assure you that such breed would not be suitable to Europe, because its clime and the march of the seasons do not admit of mulberry trees being cut and stripped several times in the year as it is in Bengal, where, after a little hoeing, it springs up again most rapidly. But though not available to my purpose, whatever information I might be able to obtain regarding the monthly breed I shall be happy to turn it to your profit.

"But the species of silk-worms which I should be more anxious to attend to are the *wild* ones. India boasts several, not inferior to China. I should

wish very much to see some specimens of the most known indigenous silk spinners, and to get some notice about their localities, habits, and food; and thus be enabled to make a good collection, both curious and instructive.

"For the fulfilment of this wish I turn to you. And indeed to whom could I better apply than to those men who personify in themselves the learning both of Europe and Asia? Therefore I pray you, gentlemen, to be so kind as to enlighten and direct me in the best way of such inquiries. Whatever may be the stock of knowledge that I shall be able to take with me for my country, I will never forget the source to which I shall be indebted, and it will be my glory to avow it to the world.

"*Calcutta, March* 16, 1859."

In returning the thanks of the Meeting to the Count Freschi for the above communication, the President assured him that the Society would gladly assist him to the best of its ability in obtaining every information respecting the wild silk-worms of India.

It was agreed that the above communication be published *in extenso* in the proceedings, and the attention of persons interested in the manufacture of silk be directed to the fact stated therein, of a disease being apparent in the annual worm; and that information be requested on the subject from the managers of other filatures in Bengal.

---

*Cultivation of the Date tree in Bengal, and manufacture of Sugar from its juice.*

The Council submitted a treatise on the above subject, which had been sent in to compete for the prize of Rs. 500 offered by the Society; and which had been pronounced by the Committee specially appointed to report on it as a practical and useful paper, and in every respect deserving of the premium. The Council accordingly recommend that the amount be awarded and the treatise published in the next number of the journal.

*Resolved*—That the recommendation of the Council be adopted, and the amount awarded to the author, Mr. S. H. Robinson.

---

*Communications on various subjects.*

The following letters were likewise submitted :—

1. From G. R. Haywood, Esq., Secretary, Manchester Cotton Supply Association, forwarding a few recent numbers of the *Cotton Supply Reporter*, and requesting to be furnished with any documentary or other information bearing upon the Society's action in reference to cotton cultivation in India.

*Resolved*—That copies of the Society's proceedings bearing on the above subject be transmitted to Mr. Haywood.

In connection with this subject it was agreed that the Council be requested to take the necessary steps for another experimental trial of cotton in the Society's Garden.

2. From Secretary Government of Bengal, forwarding copy of a letter from the Chief Secretary Government of Bombay, respecting the introduction of the Tussur silk-worm into that Presidency, and requests that the Society will furnish the quantity of cocoons required.

*Resolved*—That this application be complied with.

3. From R. Fortune, Esq., Shanghai, 5th February, intimating his intention of sending a lot of plants and seeds for the Society.

4. From Daniel Willis, Esq., Liverpool, 21st January, advising despatch, per *Marian Moore*, of the madder seed obtained from Mr. James Cowell.

[This is the seed which Mr. Cowell could not send overland in consequence of the heavy freight demanded.]

5. From the Deputy Quarter-Master General of the Army, enclosing indent for seed required for the use of the troops attached to the Darjeeling Convalescent Depôt.

The Secretary stated that this application had been partially met so far as the present means of the Society admitted.

6. From Colonel Burnett, Peshawur, 4th March, requesting the assistance of the Society in procuring a large quantity of vegetable seeds for the Soldiers' garden at that station, consisting of 27 acres of excellent ground.

The Secretary stated that the necessary steps had been taken to meet this requisition.

7. From the Secretary Branch Agricultural and Horticultural Society, Balasore, returning thanks for compliance with their previous requisitions, and asking for sugar-canes, tobacco seed, &c.

8. From Messrs. James Carter and Co., London, 21st January, acknowledging receipt of order for seeds of field crops, and promising it their best attention.

It was agreed that the third exhibition be held in the Town Hall, on Thursday, the 31st March.

---

*Wednesday, the 20th April* 1859.

W. G. Rose, Esq., Vice-President, in the Chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen were elected Members:—Messrs. C. S. Turnbull; William Harvey; G. T. B. Kemp; W. S. Seton-Karr; H. S. Onslow; E. Hudson, and the Secretary Local Fund Committee, Umritsur.

The names of the following gentlemen were submitted as candidates for election :—

D. T. Gordon, Esq., Manager Silk Filatures, Surdah,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Dr. Theodore Cantor,—proposed by Mr. Grote, seconded by Dr. Thomson.

Major G. W. Boileau, Commandant Oude Military Police,—proposed by the Secretary, seconded by Mr. C. A. Cantor.

C. F. Harvey, Esq., B. C. S., Serajgunge,—proposed by Mr. G. R. Barry, seconded by Mr. T. E. Carter.

J. S. Davies, Esq., District Superintendent of Roads, Bograh,—proposed by the Secretary, seconded by Mr. Rose.

---

The following contributions were announced :—

1. A well finished colored drawing of *Calysaccion longifolium*, which grows in the Lallbagh garden, Bangalore, and fruits freely. Presented by Dr. H. Cleghorn.

2. Specimens of tea, tobacco, and fresh water weed from China. Presented by C. Alabaster, Esquire.

The following are extracts of two notes from Mr. Alabaster respecting the above :—

" I enclose a packet of Chinese tobacco and two cases of Yunan tea, which will, I trust, prove interesting to the Society. I regret that my information respecting them is not sufficiently trustworthy to enable me to transmit a detailed account with them, but I will make a point of doing so immediately on my return to China. At present all that I feel certain of respecting them is that the tobacco is the produce of the province of Canton, the S. E., and the tea of Yunan the S. W. Provinces of China, and that the latter is highly prized, being rarely if ever brought into the market, but transmitted through China in the shape of presents. The weed is similar in nature and uses to our Irish moss: it is from the province of Huper. It differs from our sea weed in being found on the banks of the fresh water lake, the celebrated Yungting Hu."

3. A specimen of Indian wool. Presented by H. Cope, Esquire.

The following is extract of Mr. Cope's letter on the subject :—

" Whatever may be said of the Goat's wool of Thibet, Cashmere and Cabul, the *Sheep's wool* of India has hitherto been noted for its coarseness and little value. I have, therefore, the greater pleasure in sending you a small sample of a sheep's wool that has recently come into the hands of my Umritsur firm, and seems calculated materially to redeem the character of the Indian wools. I shall be obliged by your submitting it to the usual

Meeting of your Society, with the opinion of your Special Committee on the same."

Mr. W. Haworth, to whom this specimen has been referred, states that the quantity is too small to form a correct opinion as to its value; but he thinks it is worth about 1s. 4d. a lb. at home, and any quantity of it would find a ready market. It is precisely the same kind of wool, Mr. Haworth adds, as that which is now being sent home in pretty fair quantity from Bombay. To form a correct opinion of it a fleece should be sent down.

4. A specimen of wild coffee from the Sontal Pergunnahs. Presented by Mr. P. Burke.

Mr. Burke states he has seen much better in the district, but as he could not go out himself he was unable to procure them. "The coloring matter on this coffee can be removed, and I consider it rather a bad specimen. I also send some unripe coffee. I may mention that this plant is growing so entangled and entwined with other trees and gigantic creepers, that it is almost impossible to find out the root or trunk." This coffee is similar in character (though a very poor specimen) to the wild coffee of Chittagong, Assam, and other parts of Lower India.

5. A few seeds of wild coffee from Upper Assam, of the khoroi and of other plants, also specimens of wheat, fibres, &c. Presented by Captain W. H. Lowther.

6. Two tamarind trees from Khoolneah, yielding a very superior fruit. Presented by Baboo Cossinaut Roy Chowdry.

7. A specimen of fibre ("Meesta") from *Hibiscus sabdariffa*, prepared at Malda. Presented by Dr. R. F. Thompson.

This fibre approaches the common "jute" in character.

8. A few eggs of a silk-worm feeding on the wild mulberry at Simla; and some seeds of the "blistering plant" called "Cuchcha" by the natives of the hills, who use the fresh grounded root as a blister. Presented by Lieutenant J. F. Pogson.

9. A quantity of seed of *Poinciana regia*. Presented by Mr. C. Sharpe, of the Barrackpore Park, and by Baboo Praunkissen Mookerjee.

---

### *Horti-Floricultural Exhibition.*

The following report of the judges on the third show of vegetables, fruits and flowers, held in the Town Hall on the 31st March, was submitted:—

"*Horticultural.*—The judges beg to offer a few remarks on some of the vegetables and fruits submitted at the third exhibition of the season, held in the Town Hall on the 31st March.

"The show may be considered as a tolerably fair one altogether, considering the season was rather advanced for the majority of foreign esculents, and rather early for many kinds of indigenous vegetables and fruits.

"*Asparagus.*—Though rather early in the season some good specimens of green top and red top were exhibited, but not sufficiently superior to merit the reward of a medal.

"*Artichoke (Globe).*—Some fine specimens of middling size with good heads on healthy stalks were exhibited: but not up to the medal mark.

"*Bean.*—The new variety of American Long Pod beans were in large quantities and full grown. The French and broad Windsor were rather scanty when compared with those of other seasons.

"*Cabbages.*—Some fine specimens of green and compact heads of Savoy, early York and Battersea were displayed, and one basket of fine Brussels' sprouts, or the thousand headed cabbage, with fine large size Dutch red and dwarf pickling kinds of red cabbages. The whole were considered fair specimens for the advanced season.

"*Carrots*—The same remarks are applicable to this vegetable. The specimens were really good, though less in quantity than at the last show.

"*Celery.*—Some few but fine specimens of both white and red were submitted.

"*Endives (well blanched) and Lettuce (Cabbage amd Cos.)*—These were adjudged as fair specimens for the advanced season.

"*Herbs of Sorts.*—One basket of various kinds of very good specimens.

"*Scotch Kale.*—Three good specimens from three gardens were exhibited with full foliage and fine healthy size.

"*Parsnip.*—Some pretty good medium sized roots, but of the forked or crooked kind, of a rather light red muddy color. This useful vegetable is still neglected; a full and well grown root should be 15 to 18 inches in size with fine heads; of those exhibited the largest measured 10 inches, which was considered very fair for native exertion and competition.

"*Potatoes.*—The remarks made on this vegetable at the last show are fairly applicable to the present occasion, though the quantity was far less than at the last show. One variety, which was considered as raised from seed from Adelaide, was well represented as a new kind.

"*Scorzonera.*—Some better specimens than at the last, and in larger quantity.

"*Squash.*—From only one garden, with three poor sized fruits.

"*Turnips.*—Though small in quantity and of rather poor quality, still, on the whole, all were considered very fair specimens for the advanced season.

"Besides these several baskets of tomatas, water cress, capsicum. Indian corn, yams and saugs of sorts, were introduced.

"Among the fruits some fine specimens of loquots were produced; also

"*Guava.*—Very indifferent and poor, rather too early for this fruit.

"*Lime.*—Some very fine specimens of large size and juicy.

"*Lemons.*—Some very fine specimens of English lemons from stock originally raised in the Society's garden.

"*Melons.*—(Sweet or Mountain and Musk Melon)—Were very fair specimens for this time of the year.

"*Mulberry.*—Some really sweet and fine kinds.

"*Pomegranates.*—Some fine specimens, with large grain and very juicy.

"*Pine Apple.*—Very fair for the present season.

"*Peaches.*—Some very fine specimens of the early kinds originally from the stock from the Society's Garden, as the 'Robison,' 'Stalkartt,' and 'Lucknow.'

"*Sapotas.*—As the remarks for the last show.

"Of the native greens and vegetables there were several good specimens of brinjal, cucumber, pulwal, ginger and dharus. Though these were not enumerated in the Prize List, they were considered fairly deserving of notice and rewarded accordingly.

"About eighty gardeners were in attendance, and forty-two of them received prizes amounting to Rs. 160, as per annexed list in detail.

"W. G. Rose.

"Peary Chand Mittra.

"T. A. C. Firminger.

"Joseph Agabeg."

---

"*Floricultural.*—At the show held on the 1st April 1857 (there was no third show last year in consequence of the Town Hall not being available), the orchids formed the chief attraction, eight gardens contributing towards this department. On the present occasion a very few plants of this beautiful family were submitted for competition from three gardens, exclusive of some fine specimens from the Botanic and Society's Garden. From Mr. C. B. Stewart's garden came three fine plants of *Phalænopsis amabilis,* and a handsome specimen of *Oncidium luridum* from Mr R. Wood's garden. Among those from the Botanic Garden were included an undescribed *Vanda* from Darjeeling, two undescribed *Saccolabiums* from Assam, *Vanda gigantea,* and a new flowering *Œrides* from Burmah, *Renanthera coccinea, Eulophia virens,*

*Saccolabium micranthum, Dendrobium Pierardi majus,* and a group of plants of a small terrestrial orchid, probably *Eulophia.* From the garden of the Society were *Dendrobium chrysanthemum, Epidendrum crassifolium, Saccolabium guttatum, S. micranthum,* and *Phalænopsis amabilis.*

"There were a few plants in the general collection deserving of notice, namely, a well grown example of *Rhyncospermum jasminoides,* in full flower, quite a novelty, from Mr. C. B. Stewart's garden; another of *Peliosanthes Teta* from Mr. W. Stalkartt's garden; a *Richardia æthiopica,* in flower, from the garden of the Reverend T. A. C. Firminger, a collection of *Obeliscaria pulcherrima,* some rare kinds of *Salvia,* with blue and red flowers, fine specimens of a white flowered Java *Ixora* from the gardens of Messrs. R. F. Ross and T. G. Swinden, some well grown plants of *Gladioli,* a very good collection of *Amaryllids* from various gardens, a new variety of *Verbena* from Mr. H. H. Murdock's garden, and a few *Gloxinias* from the Society's and Botanic Gardens. The latter garden also contributed a collection of plants as specimens of peculiar coloring and forms of foliage, *viz. Lygodium, Nephrodium, Lycopodium, Arundo, Calamus, Areca, Livistona, Bilbergia, Caryota, Dracæna, Cissus, Graptophyllum, Croton, Pavetta and Ruellia.*

"The number of gardens that contributed were twenty-two, and prizes, amounting in the aggregate to Rupees 108, were adjudged to seventeen gardeners.

"The number of visitors was considerable.

"The prizes were awarded by C. A. Cantor, Esq., Vice-President.

"Mr. Robert Scott, of the Botanic Garden, kindly assisted the Judges.

"J. Scott Elliot.

"A. H. Blechynden."

*Nursery Garden.*

The Gardener's Monthly Report was submitted, of which the following are extracts :—

"In continuation of my report for the past month, I beg to state for your information, that I received, in the beginning of the present month, five Ward's cases of plants from Mr. R. Fortune from China, as per enclosed list, which forms a report on the contents of the cases, and also to state that the whole of the plants have arrived in a very healthy state and good condition. All the *camellias* are fine, healthy, and robust plants, and of a size perhaps scarcely ever known to have been imported before; the tallest measures 35 inches in height, and only two small ones measure 16 inches; but

the average height is 32 inches. Moreover, these plants are not only in good health and full foliage, but have started fresh and produced new leaf buds, and have flowered profusely, some yielding very choice and handsome descriptions of flowers.

"The seeds of *Salisburia* sown in the case have been germinating very freely, and I consider it satisfactory, as also the sweet chesnuts and the small hazel nuts. Of sweet chesnut 177 seeds have germinated, *Salisburia* 121, and of the hazel 48. Of the Laurus or Camphor tree seeds very few have germinated; and though I have put down the rest in gumlows, I am apprehensive of their germinating.

"Of the eighteen peach plants ten are in good health, five are sickly, and three apparently withering off. Of the latter two are the Shanghai peach, and the other is a single plant.

"It appears to me that these peaches are again distinct from those forwarded by the same gentleman in 1854. Of the Moutans or Peonies excepting one plant the rest appear to be in pretty good health; though the season is much against them, still the majority are at present pushing out fresh leaves, and appear to be regaining health.

"Of the three packets of acorn or the Cork oak seeds, received from Messrs. Carter and Co., those sent in earth have germinated freely; there are now above 130 seedlings, but owing to the oppressive heat, these are not thriving so well as when they first sprouted up, though kept in a cool, sheltered situation. Those packed in sugar and sand have entirely failed.

"The eight kinds of mango stones, of five sorts, in all eighty-one seeds, received from Major Voyle of Mooltan, were laid out in cutcha nursery beds on receipt, but have failed to germinate: the cause of failure I attribute to the seeds being picked in an immature state.

"The seeds of *Passiflora quadrangularis*, received from Mr. T. P. Larkins, have germinated pretty freely, yielding an average of 30 per cent.

"The vegetable seeds received from Mr. Cowell, on the 3rd of last month, containing the Citronella or the huge pumpkin, and Pahanya, another pumpkin, and huge flat raddishes, have all germinated very freely, and are thriving well, excepting the raddishes, which have suffered much from the present hot sun. The seeds of squash and pumpkin, received from Mr. R. S. Halfhide, have also germinated; these seeds were exceedingly good, yielding an average of one hundred per cent. Captain Lowther's seeds of prize melon have also germinated very satisfactorily.

'The Munjeet seeds received from Dr. Campbell, Superintendent of Darjeeling, were on receipt laid out both in trial gumlows and cutcha nursery

bed, where the whole have freely germinated, giving an average of above 80 per cent. A packet of seeds of *Hibiscus Africanus*, received from the Reverend Mr. Firminger, have been germinating very freely.

"The Pernambuco cotton seeds, received from Mr. Stewart Douglas, are just germinating, and though it would be premature to state positively the final result, yet judging from the ready germination it may be calculated that it will yield an average of 40 per cent.

"The six kinds of Imphee seeds, received from Doctor Balfour of Madras, sown in the economical portion of the garden, have not only started well, but are now more than 4 and 5 feet high, and doubtless were they sown in the beginning of the rains, it being a rainy season crop, the whole would have done better, and probably their growth would now be more than 10 feet high. The *Sorghum saccharatum* (which if not identical is closely allied to the Imphee), received from General Sir John Hearsey last year, not only yielded a crop in November last, but being cut has again thrown out new shoots, which are now in bloom, and will soon yield another crop, which, though it may not be so abundant as the last, yet the produce will probably be satisfactory.

"I beg now to forward a tabular statement, showing the result of the produce of the pea crop for the past season, 1858-59, the total of which is 14 mds. 12 seers 11 chittacks, which is the produce of 3 mds. and 31 seers, less 1 md. 9 seers, which failed to yield a produce, though the seeds germinated freely, as before reported. The total produce is about less by one-third the quantity anticipated, owing to the loss sustained from the heavy rains, in the early part of March, by which all the dwarf kinds of peas, together with those which had ripened fully, including Carter's Early Emperor, suffered considerably.

"In submitting this statement I beg to remark that the report of the trial sowings in pots of the seven kinds of American peas, as submitted in July last, have been fully borne out in the sowing of the same seeds in open ground in November following, when they not only freely germinated, but, as is shown by the result, they yielded a prolific crop, especially the Black-eyed Marrowfat, which is a very superior kind.

"Of the Cape seeds the trial sowing resulted in an average of 80 per cent.; the same peas on being sown in open ground resulted equally as favorable. The large Marrowfat and Imperial Blue yielded the best, the Prussian Blue and Sugar Pea pretty good, but the Cape Sugar Pea showed a slight failure; yet on the whole the result was favorable.

"Of the English seeds from Messrs. Gibbs and Sons the result is equally favorable, as the produce yielded shows a return on each seer of 3 seers and 4 chittacks.

"As regards the seeds from Messrs. Carter and Co., it is much to be regretted that the shipments arrived so late in the season, the hot weather having stunted and diminished the whole crop.

"The arrow-root prepared for the past season is 3 maunds and 6 seers out of a small produce, all which is forwarded, as also such of the third crop of the American corn as has been collected for distribution to the members, which are as follows :—

| | | | |
|---|---|---|---|
| "Adam's early corn | ... | 317 | Cobs. |
| "Yellow flint corn | ... | 126 | " |
| "Cooper's prolific | ... | 95 | " |
| "Yellow Canada corn | ... | 78 | " |
| "White Canada corn | ... | 71 | " |

"The specimens of each kind is full and very satisfactory for the present season of the year. I shall still be able by next week to forward some more cobs raised from the seeds received from Mr. Sharp of Barrackpore Park during the past year.

"In conclusion I beg to say that one of the *Araucaria Cunninghami* has thrown out two fine cones for the first time, other small ones have already dropped off immaturely, but I fully expect these two will seed well in time. In the Conservatory the *Phalænopsis amabilis*, presented by C. B. Stewart, Esq., having come into flower for the first time. I beg to send it for the inspection of the meeting."

*Plants and Seeds from China.*

Read the following letter from Mr. R. Fortune, dated Shanghai, 10th February, advising despatch of the seeds and plants alluded to in the Gardener's Report.

"I have the pleasure to enclose with this letter a list of a large collection of plants and seeds which I have made for the Society in the Eastern and Central Provinces of China. Many of the species are very remarkable and well worthy of being introduced to India.

"In particular I may call your attention to the Camellias. Amongst them are two varieties—the 'Cup of Beauty' and 'Princess Frederick William,' whose flowers have all the symmetry of the 'old double white,' and at the same time they are finely striped and variegated. They sport, too, in an extraordinay manner, and often produce self-colored blossoms and variegated ones upon the same plant.

"The double flowering peaches are also well worth the attention of the Society. Their flowers are large and double, and at a distance the trees, when in bloom, look as if they were covered with roses. The carnation

striped kind is a vaiiety of great beauty. Like the camellias just noticed it produces striped and self-colored blossoms upon the same tree.

"I trust the seeds of the camphor tree will vegetate freely. Some of them have been sown in a pot, others in the soil of the cases, and a packet is sent round in paper. The camphor tree is much prized in China and Formosa, where it forms a tree of great size and beauty in addition to its commercial value.

"A large quantity of the seeds of the funereal cypress are sent for distribution amongst the Members of the Society.

"Such plants as *Moutans, Salisburia, Wiegelia, Abies Kæmpferi,* &c., are likely to succeed better amongst the hills, or in the northern parts of India, than near Calcutta."

It was agreed that the majority of these seeds be reserved for distribution to Members desirous of giving them a trial.

*Disease in the Annual Silk-worm of Bengal.*

The Secretary read the three following communications which he had received since the last meeting on the above subject :—

No. 1. *From Mr. G. De Cristoforis, of Rajahrampore, Zillah Moorshedabad, dated* 10*th April* 1859.—"I read with no little surprise in some No. of the *Hurkaru* and the *Indian Field* the startling announcement made by Count Freschi, before the Agricultural and Horticultural Society, that in the annual silk-worm of the Radanagore District he found the similar epidemical disease which is known in France and Italy since some eight years, and which has now reached there to such a point as to nearly destroy the European cocoon crop.

"It was, by what I know, Count Freschi's very important mission to come out here to procure fresh silk-worm eggs, which would have restored the nearly falling off stock of Europe, and I can well imagine the disappointment which will be experienced by the numerous subscribers he collected in both France and Italy on hearing that all the heavy expenses they are now incurring will be of no avail in their high expectation.

"I very much regret to see further how Count Freschi, disappointed in his first trip of a few miles in one of the nearest districts of Calcutta, completely gave up all researches in other parts of Bengal, and principally in the Districts of Moorshedabad and Beerbhoom, where, *he was timely told*, he would have found on the contrary perfect health in the annual silk-worm, their crop of cocoons having here resulted this year an unusually good one in quality and quantity. This I can state on good ground, as I have here in my

factory three other Italians, who, although forming another party, came out here for the same purpose of preparing silk-worm eggs, and you can well fancy how their attention was given in making researches whether or not the symptoms of the epidemic found by Count Freschi really existed also about here.

"These Italians even reared silk-worms of all ages and procured from different directions, in my house, to better satisfy themselves on this point; and we are happy to state that the worms went through all their changes in perfect health, and completed with success their cocoon, never showing the least sign of being attacked by any epidemic whatever. Only in looking to the yield of eggs given by the butterfly, of which I have notes, which I should be glad to submit to the Society, if of any interest, and to the beautiful way in which the cloths are completely covered with eggs, a man who understands thoroughly this branch would not hesitate a moment to say that the silk-worm had none of the epidemic which the Count attributes to it, but that on the contrary it went through all its transformation, always enjoying the most perfect health.

"It would have been of great interest to the Agricultural and Horticultural Society, and almost indispensable for Count Freschi, if he had brought before this Honorable Congregation a few of the worms attacked by the symptoms of the epidemic; not only the Society would have seen and known more positively of it, but the Count would have had an undeniable authority to confirm his statements.

"I sincerely hope that the Agricultural and Horticultural Society, who has already given so much attention to Count Freschi's statements, will now for the interest of this country make inquiry with its numerous correspondents, and amongst the natives of the Radanagore district, regarding this epidemical disease, as I trust it will be found by their result that the Count's statements were too hasty, and required more palpable proofs before his having made them known to the public here and at home. It is there of so great an interest to have good silk-worm eggs, that other enterprising people have already come out, as did these Italians who are with me, who, without the patronage of such eminent and influential personages as the Archduke Governor of Milan, and without knowing English or Hindostanee, had the courage to come so far in the interior, resolute as they were to gain their object, which I am glad to say they have nearly attained, if it was not for Count Freschi's statements, which might greatly be injurious to them at home, if allowed their course without further enquiries, which I trust will result to their advantage."

No. 2. *From Mr. D. T. Gordon, Manager of the Surdah Silk Filatures, dated 6th April* 1859.—" On this side of the Ganges we have no annual

cocoons at all, and there are very few indeed between the Ganges and the Bhagirutty, but they are more plentiful in the Beerbhoom district. I have had no opportunity of observing whether the cocoons are affected with the disease which has done so much damage on the continent of Europe."

No. 3. *From Mr. C. S. Turnbull, Manager of the Ghuttal Silk Filatures, dated 18th April* 1859.—" In reply to your favor of 16th instant, I beg to say I have read the statement of Count Freschi published in the proceedings of the A. and H. Society respecting a disease having appeared in the annual silk-worm similar to those of Europe. However I differ with him in opinion, inasmuch as I have observed no disease in the annual worm, and the natives who rear them assure me that there are no symptoms of disease whatever, though the appearance and yield of the cocoons this year are not so good as that of former years, which I attribute to the heavy rains and cloudy mornings when the cocoons were coming to maturity."

The Secretary mentioned that he had given Count Freschi an opportunity of perusing Monsieur De Cristoforis's letter, and had received a second communication from him, of which the following are extracts. The Count also submits a cloth covered with eggs of the annual worm from the Radanagore and Moorshedabad districts :—

" As I told you yesterday nobody would have had a greater interest than myself to profit of all the convenience and assistance which Mr. Turnbull offered me in order to obtain 10,000 ounces of seed, which would have produced 200,000 francs, as my subscribers are bound to accept at the rate of 20 francs per ounce the seed that I shall procure for them from Asia. My motives must have been very great indeed to renounce such an easy and pure profit; it was but the conviction that I would have betrayed my subscribers and my own conscience by supplying them with a seed which could neither answer my purposes nor their expectation. I have no need to have recourse to excuses or false motives to defend myself towards my subscribers, as my engagement with them is conditional (see the report of M. Guerin de Menneville in the *Bulletin de la Societé d'acclimitation,* 11 Novembre 1858), and my experience, both practical and scientific, shows me that the seed will have no chance of success in Europe. It is my interest to send them seed; can it therefore be possible that I will act against my own interests just for the mere pleasure of imagining that there exists a disease where in reality there is nothing ?

" I will maintain before the whole world what I stated to the Society in my report of the 16th March, in which speak of but one district of Bengal; but to me, as well as to all in Europe who are acquainted with the nature of this disease, to find it even in one corner of Bengal would be sufficient to

consider the seed of Bengal not *absolutely* healthy, especially when the cocoons every where show the same symptoms of degeneracy.

"I have seen cocoons of Moorshedabad, and although picked they were far inferior to those we consider rubbish in Europe; and some of the moths had stains on their wings, and evacuated a black humour, similar to those of Ghuttal and other places, the eggs of which are laid on the piece of cloth I send you. You know that black secretions of the moths are also considered a characteristic symptom of the disease.

"Any body who knows the different characters of the epidemic disease of the silk-worms should discover it only by looking at the seeds of this cloth. The normal gray bluish color of the annual silk-worms' eggs is mixed with eggs of reddish and particularly of green color, which, according to the opinion of the most intelligent observers, is a degeneracy attributable to the disease. Besides which the black spots of the cloth, which are unnormal secretions of the moths, indicate also the disease."

*Communications on various subjects.*

The following letters were also read :—

1. From Stewart Douglas, Esq., Manchester, dated 2nd November 1858, advising despatch of a quantity (about 25 maunds) of Pernambuco cotton seed, in pursuance of the order entrusted to him in 1857 by the Society.

*Resolved.*—That this seed (which has just arrived) be advertized for distribution *gratis* to Members and to others desirous of receiving it for public purposes; and at cost price to non-members cultivating on their own account.

2. From T. B. Mactier, Esq., Officiating Collector of Pooree, of which the following is an extract :—

"Being anxious to introduce on a large scale the cultivation of improved produce in the Government Khas Mehals in this Zillah, I have the honor to solicit the Society's assistance in procuring seed.

"*2nd.*—After communication with the superior local authorities, the two plants most likely to give an immediate return are tobacco and common cabbage; of these I estimate I should require a quantity not exceeding 10 maunds and 1 maund respectively; however, as the price is a matter for consideration, may I solicit you will inform me of the cost of each laid down in Calcutta.

"*3rd.*—Tobacco has succeeded very well here, and cabbage also, and is much liked by the natives, who have apparently less choice of native vegetables than is found elsewhere.

"*4th.*—I shall, of course, be only too happy to report to the Society the result of the experiment, and I believe, from the establishment that I have at my command, that report would be as full and as authentic as the Society could desire. As to the sort of seed, the Society will be the best judge; the soil very much resembles that of Bengal, our best tobacco being grown (and a very fine sort it is) on the alluvial deposit of the sandy beds of the rivers. The daily increasing sale of manufactured Madras tobacco, the soil on which the raw produce is grown being not very dissimilar to that of this zillah, raises the question to one of importance.

"*5th.*—On hearing from you what the price is likely to be, I shall immediately do myself the honor of communicating in regard to the quantity I will require."

The Secretary mentioned that he had suggested to Mr. Mactier a reference to the Commissioner of Arracan for seed of the Sandoway tobacco, and to the Collector of Rungpore for seed of the fine tobacco of that district. Further that he had given him the necessary information in respect to the cabbage seed.

3. From the Secretary Government of Bengal, enclosing copy of a communication from the Madras Government for a supply of the Chinese Green Dye plant, with direction for its culture and the subsequent preparation of the dye.

The Secretary announced that, previous to the receipt of this letter, all the plants available in the Society's Garden had been disposed of, but that this application would be met in due course from cuttings recently put down; and that the required information would be furnished at the same time.

4. From E. H. Gatfield, Esq., submitting a specimen of Rheea fibre prepared last season at his factory in Purneah, and hoping that though the quality he has sent is not equal to that required by the terms, that the Society will award him the prize and gold medal.

A report from a good judge of this fibre was also submitted, unfavorable to it in comparison with the produce of Assam, as also a memo. from the Council, regretting their inability to recommend a compliance with Mr. Gatfield's request. Thereupon it was resolved that a communication to the same effect be made to Mr. Gatfield.

5. From Baboo Cossinat Roy Chowdry, intimating his desire to establish a Branch Society at Shatkerhah, if the Society will assist him.

*Resolved.*—That the usual assistance be accorded.

6. From Colonel F. C. Burnett, dated 23rd March, returning thanks for the offer of assistance in obtaining seeds for the Garden at Peshawur under his

management. "I never saw finer garden soil"—observes Colonel Burnett—"than we have in this station. Till within the last week the garden has supplied the whole of the European troops at the station with good vegetables, and this is only the first year of the garden. I have corrected your list to suit our purposes, for we must try to supply the vegetables that are most approved of by the men, and also with an eye to make the garden pay its expenses. We sell to the Commissariat Department, and we have generally realised about 450 rupees a month. You will be surprised to hear that the country carrot, which is very fine, is now selling at 16 maunds for one rupee: it is the dark purple sort. I will be greatly obliged if you can send me as much of the Riga and Dutch Flax seed as you can spare. I am sure there is no better soil or climate in the world for flax than the Punjaub, and also this valley. I hope you will also send me some good tobacco seed; it grows very well here. I doubt very much if flax can be raised to such advantage in any part of Bengal as in the Punjaub, the cool season is not of long enough duration. Flax should be in the ground at least 110 days."

7. From H. Cope, Esq., on the subject of silk, of which the following is an extract:—

"I have every reason to believe that the same wild silk-worm noticed in my paper on the introduction of the silk-worm in the Punjaub (and regarding which Mr. McLeod has directed the most precise enquiries to be made in all the Hill Districts), as being indigenous to Simla and its vicinity, is also to be found in the Hills about Almorah. I hope to send further particulars."

8. From E. Chardon, Esq., Kishnaghur, respecting the flower seeds supplied last year to the Society by Messrs. James Carter and Co. "Though not a member of the Society until last year, since the last eight or nine years I always managed to procure from members of the Society best seeds of flowers and vegetables; and I have never seen such magnificent flower seeds as we have had this past season. Every seed vegetated splendidly, and to the present moment (28th February) nearly all have flowered freely, and the collection of different colors and shades of Heartsease and *Portulacas* is superb."

9. From Baboo Gourdoss Bysack, Secretary Branch Society of Balasore, returning thanks for a complete set of the publications of the Society, for sugar-canes of foreign sorts, &c., &c.

10. From Dr. W. Jameson, Saharunpore, intimating that the seeds of field crops [supplied last year by Messrs. Gibbs and Co.] have totally failed to germinate.

(An order for this year's supply has been entrusted to Messrs. James Carter and Co.)

**11.** From H. Cope, Esq., on the subject of flax cultivation in India:—"I have read with much interest the report of your Flax Committee, submitted at the last meeting of the Society, and am happy to learn that something is likely to be done in the way of improving the flax cultivation in India. While, however, the good peòple of Dundee, of Leeds, and of Belfast have been *talking* of the necessity of stirring actively in the matter, and have been soliciting the aid of Government, instead of helping themselves, it may be of some little importance to your Society to know that my firm is, at the present moment, actively engaged in buying up and preparing such of the flax of the Sealkote and other districts as have been sown during the past season almost entirely at our suggestion. I cannot say what the actual out-turn may prove, but it will be considerable comparatively speaking; and I entertain very little doubt, from the arrangements made, that it will be superior in quality to any hitherto sent into the market: a large portion is already bespoken. Samples will soon be available, and I will do myself the pleasure of sending some of the first that may come to hand for submission to the members of your Society. I may add that the current season has been most favorable, and that the length of stem is said to be beyond that of all previous years. Mr. McLeod and Mr. E. A. Prinsep have manifested the greatest desire to promote the operations of my firm."

**12.** From Captain W. H. Lowther, several communications written in March from Suddya and other parts of Upper Assam, respecting the seeds and specimens previously referred to.

**13.** From Mr. Patrick Burke, applying for long staple cotton seed for trial in the Sonthal Pergunnahs.

Agreed that this application be met.

The Council submitted a recommendation for an additional monthly expenditure of eleven and a half rupees for the native office establishment. Agreed to.

For all the above communications and presentations the best thanks of the Society were accorded.

---

*(Thursday, 12th May 1859.)*

W. G. Rose, Esq., Vice-President, in the Chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen were elected Members:—

Messrs. D. T. Gordon; C. F. Harvey, C. S.; J. S. Davies; Dr. T. Cantor, and Major G. W. Boileau.

The names of the following gentlemen were submitted as candidates for election :—

Charles F. Wintle, Esq., Sub-Deputy Opium Agent, Futtehpore,—proposed by Mr. Henry Deverell, seconded by the Secretary.

Frederick W. Morris, Esq., Madras Civil Service,—proposed by Mr. T. J. Knox, M. C. S., seconded by Mr. W. G. Rose.

Dr. F. J. Earle, Civil Surgeon, Purneah,—proposed by Captain Archibald Impey, seconded by the Secretary.

C. N. Cooke, Esq., Deputy Secretary, Bank of Bengal,—proposed by Mr. C. A. Cantor, seconded by Mr. R. Blechynden.

Sir John Wemyss, Bart., Berhampore,—proposed by Mr. H. Deverell, seconded by the Secretary.

S. E. Collis, Esq., Solicitor, Calcutta,—proposed by Mr. J. S. Elliot, seconded by Mr. S. P. Griffiths.

Lieutenant J. S. Vertue, Madras Engineers, Vizagapatam,—proposed by Captain W. Owen, seconded by the Secretary.

---

The following contributions were announced :—

1. Miscellaneous Papers relative to the production of silk chiefly in connection with the Punjaub, printed and officially circulated by the Financial Commissioner of the Punjaub. Presented by H. Cope, Esq.

2. The Almanac and Companion for the North-West Provinces and the Punjab for 1859. Presented by W. H. Carey, Esq.

3. Journal of the Asiatic Society of Bengal, No. 1 of 1859. Presented by the Society.

4. A quantity of Dahlia tubers from Mussooree. Presented by Captain T. Hutton.

5. Seed of the kurna or kim tree of the Punjaub, a lime tree often attaining the height of 15 and sometimes 20 feet, and very ornamental. Presented by H. Cope, Esq.

6. A quantity of *Amaryllis* seeds, collected by him from the finest kinds of *Amaryllis* (crossed). Presented by R. F. Ross, Esq. Mr. Ross writes :—" I generally raise them in gumlows at the commencement of the rains, and plant them out after the rains are over. No doubt you will get many new varieties, as I have ; some will flower in the third year." (A portion of this seed is available to members.)

7. A specimen of paddy and one of rice forwarded by Dr. Walker from the Andamans. Presented by C. Beadon, Esq.

Baboo Pearychand Mittra observes that the rice appears to be like the *dessee moonghy,* or in other words the moonghy, not of Rungpore and

Dinapore, and he values it at rupees 2-7 per bazaar maund, at which price he thinks it will meet with a ready sale there. The paddy he finds to be *khajla ballam,* which is consumed by the lower orders of the people, and exported to Madras, Colombo, &c.; he values it at 2 rupees per maund.

8. Specimens of "Kosta" and "Meesta" fibre, with seed of both; also linseed stalks, all the produce of the Jessore district. Presented by H. G. French, Esq.

A few well-flowered orchids and bulbous plants, from the Society's Garden, were also placed on the table.

*Nursery Garden.*

The Officiating Gardener's Monthly Report was submitted, of which the following are extracts :—

"In continuation of my monthly report for the past month, I beg to acquaint you that I received three plants of China Mangoe grafts from Mr. Sharpe of Barrackpore, which is a new species new to the garden.

"The *Areca* palm seeds of Assam, received from Captain Lowther, have freely germinated and have yielded a fair average percentage, that is above 70 per cent., as also the "Koori" seed (Acacia catechu) received from the same gentleman. Of the seven seeds of the Burmah fruit, presented by Mr. Joseph Agabeg, called the *Maryam* in Burmah, and known as the *Mangifera oppositifolia,* or *Cumbissidea oppositifolia,* five seeds have already germinated. The fruit of this plant is of the size of the Indian Olive, and the color a greenish sulphur; it is eaten universally in Burmah, and imported here after pickling; it has a fine acid taste.

"Of the several kinds of garden produce seeds laid down from time to time in trial gumlows, I am glad to report a favorable result, as all have freely germinated and yielded a return of more than eighty per cent., amongst which were the *Gloxinia Cerena, Tetraninia Mexicana, Ardisia crenulata,* introduced from Mauritius, producing deep pink berries, which, when ripening, turn into beautiful lilac red, seeds of *Rosa Princess Adelaide, Lemonia spectabilis,* and others.

"In the economical garden, plots have been ploughed and trenched, and the different yams of the rainy season's crop have already been set, among which are the *Dioscorea Batatas,* received last year from Messrs. Gibbs and Co. of London, as also the two kinds of yam, red and white, from Mr. Fortune from China,—also the red yam received from Captain Weston and the New Zealand, or Ærial yams received from Captain Hill and Mr. Sharpe, together with the four kinds of sugar-canes, for which the plot was newly ploughed

and manured as well as top-dressed; also the plots for jute and two kinds of Hibiscus, Jubbulpore Hemp, and Papeng or the Chinese fibre-yielding plants, which will be laid down the first favorable day after the first good shower of rain: with these will be included the two kinds of seeds received from Mr. H. G. French, *viz.* jute and meesta.

"The cotton plants in the three plots, since the last fall of rain, have been considerably reviving, inasmuch as the plants have taken a more healthy start, and are coming to bloom, though from pruning they seem not to have derived any material advantage, as instead of growing with vigor and becoming robust, all the plants appear much to diminish, and the produce to have deteriorated, as will be seen from the accompanying sample of Pettigulf cotton, of which the staple of the first picking was of much better quality; but since the recent shower the plants have taken a more healthy start, therefore during the rains the plants may grow more vigorously.

"The plots under irrigation as an experiment fully prove that in high land such an artificial measure for such plants is indispensably necessary, as the plants have taken a more healthy start, and have come into bloom; whilst those non-irrigated seem somewhat flagging; consequently, I am led to believe that the whole of the plants would succeed much better in somewhat lower spots, or where annual inundation deposits its rich store, and leaves sufficient moisture to help the plants throughout a hot season. I also believe that cotton plants are much deteriorated after the second year's produce, and that each description of cotton should be renewed after the second year, as I find young plants produce the best description of cotton.

"Failing last year to obtain any raddish seeds, I had adopted a mode to rear a few for the purpose of getting the plants to produce seeds, for which I had detached a few from the plots where the raddishes were originally sown. This had the desired effect, as whilst those in the original place grew to healthy plants, produced flowers in abundance but gave no seeds; whereas the mode I adopted not only got them into flower, but has given a small quantity, as much as I could expect. On a previous occasion I sent a small quantity of the seeds, and now beg to forward a second batch of three kinds of raddish seeds, *viz.*, American white, red turnip-rooted raddish, and Cape mixed raddish. This successful result gives me every hope that seeds from American and Cape stock may be raised with advantage. With this I also beg to forward a small packet of onion seeds, raised from Bombay onion bulbs, received from Mr. Butler in 1857. These seeds are of a superior quality, and as they are very fresh, I have hopes that every seed will freely germinate, to ascertain which result I have already sown a hundred of them in my trial gumlows."

*Munjeet.*

Several letters on the above subject were read from Dr. Campbell of Darjeeling, Dr. Gibson of Dapooree, and Mr. Cope of Umritsur, and referred to the Committee of Papers for the Journal.

*Communications on various subjects.*

The following letters were likewise submitted :—

1. From Captain Thomas Hutton, Mussooree, advising despatch of Dahlia roots, and offering the following remarks on their treatment :—

"When the planting season arrives, the tubers should be dug up (not before); a deep hole of about 2 feet to 3 feet in depth should then be prepared and receive a good bottom of rich old manure; upon this place the tubers, and cover them also with manure, and then fill in with the earth. Dahlia roots dug up in autumn (at least in this cold climate) almost invariably suffer during the winter. Those which are left in the ground, even though there be 4 feet of snow on the surface, will not suffer; then in the spring dig them up, and prepare for re-planting as above."

2. From C. W. Wilmot, Esq., Assistant Commissioner, Sonthal Pergunnahs, applying for a quantity of Pernambuco cotton seed for distribution amongst the most intelligent and industrious of the Sonthal heads of villages in his jurisdiction.

3. From Mr. Manuel, submitting some notes on the culture and propagation of roses in the Society's Garden.

4. From D. T. Gordon, Esq., Superintendent Silk Filatures, Surdah, promising, as requested, to communicate, in due course, the result of his trials on the annual silk-worm's eggs (green and purple), which Count Freschi pronounces to be diseased.

5. From C. S. Turnbull, Esq., Superintendent Silk Filatures, Ghotal, to the same effect.

For all the above communications and presentations the best thanks of the Society were accorded.

---

*(Wednesday, 8th June* 1859.*)*

W. G. Rose, Esq., Vice-President, in the Chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen were elected Members :—

Messrs. C. F. Wintle; F. W. Morris, M. C. S.; C. N. Cooke; S. E. Collis; Dr. F. J. Earle; Sir John Wemyss, Bart.; and Lieutenant J. S. Vertue.

The names of the following gentlemen were submitted as candidates for election :—

E. L. Vincent, Esq., Civil Engineer, Monghyr,—proposed by Mr. Hartley Watson, seconded by the Secretary, Monghyr Public Garden.

Edward Grey, Esq., Civil Service, Gya,—proposed by Mr. E. F. Latour, seconded by Mr. C. A. Cantor.

Lewis Cosserat, Esq., Lall Seraiah Factory, Chumparun,—proposed by the Secretary, seconded by Mr. W. Stalkartt.

George Palmer, Esq., Civil Service, Bijnore,—proposed by Mr. C. E. Chapman, seconded by the Secretary.

William Thomson, Esq., Superintending Surgeon, Dacca,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Stuart Colvin Bayley, Esq., Civil Service,—proposed by Mr. A. Grote, seconded by Mr. H. V. Bayley.

---

The following contributions were announced :—

1. Miscellaneous Papers relative to the production of silk chiefly in connection with the Punjaub, printed and officially circulated by the Financial Commissioner of the Punjaub. Presented by D. F. McLeod, Esq.

2. Townsend's Annals of Indian Administration, Part I. Vol. 3. Presented by the Government of India.

3. A small supply of mulberry silk-worm cocoons raised at Umritsur. Presented by H. Cope, Esq.

4. A muster of cotton from the Sonthal Pergunnahs. Presented by Mr. P. Burke.

5. Six orange seedlings of a superior kind, and two good-tasted mangoes. Presented by A. J. Sturmer, Esq.

These orange seedlings are from up-country stock, of which the produce was presented by Mr. Sturmer at the Meeting of January 1858, and some plants at the following July Meeting. The following is Mr. Sturmer's notice regarding the mangoe :—

" About twenty years ago I obtained a graft from the Botanic Garden, I think it was called the ' Arbuthnot,' which I planted in my garden along the eastern wall. About five years after I made a graft from it, and placed it along the western wall. The latter is a much larger and more vigorous plant—the fruit fewer, but much larger. My treatment is, at the commencement of the hot season to remove some of the soil, re-place it with cow-dung, and water well and frequently, make holes about the roots a foot or 18 inches deep, which keep the roots moist—by so doing during the excessive heat the

young fruit does not drop off very much. I have remarked that, as soon as it rains heavily in June, the flavor of the fruit is changed, and becomes insipid."

6. Some branches of the "Woondee" of Western India *(Calysaccion longifolium)*, with fruit on them, the produce of his garden at Howrah. Presented by James Chew, Esq.

7. Eight bags of paddy from Arracan, and some Cinnamon and Bay plants. Presented by Captain F. W. Ripley.

These plants have, unfortunately, arrived quite dead. Captain Ripley mentions that the paddy is of an excellent kind, called "Gnapyanuewon," that answers on the higher sandy ridges where the heavier grains do not thrive. The rice is an excellent table rice.

Baboo Pearychand Mittra reports that this rice "is much inferior to our *ballam*, and approaches *kyari*, which is not a strong and bold grain, and sells at three to four annas per maund lower than the *ballam*. I value this rice at 1 rupee 14 annas per bazaar maund."

8. Seeds of several kinds of trees and shrubs collected in the Barrackpore Park. Presented by Mr. C. Sharp.

9. A quantity of mignonette seed. Presented by T. Savi, Esq.

10. A sample of arrow-root grown and prepared at Fort Gloster. Presented by W. Eames, Esq.

Dr. Mouat considers that this arrow-root has been well prepared, and is a good, sound, wholesome article.

*Nursery Garden.*

The Officiating Gardener's Monthly Report was submitted. Mr. Manuel acknowledges receipt of several contributions of seeds and plants, among others a case of roses from the Mauritius; and a few seeds of *Vangueria edulis* of Madagascar, from Mr. Scott of the Botanic Garden. The seeds of the Chinese green dye plants, received from Monsieur Rondot of Paris, have not germinated, and as yet only a portion of the Chinese seeds recently received from Mr. Fortune. The gardener then goes on to report as follows :—

"Among the fruit-bearing trees for the present season the *Calysaccion longifolium*, or the *Woondee* fruit of Madras, has also been bearing fruit for the second time this year—of which fruit I beg to forward a specimen. I find the fruit to have a fine sweet pulp and good flavor. When ripe its color is slightly yellow, with a light green, afterwards turning into a chocolate color; some have one seed and some two, and its size is of an ordinary nut.

"In the Economical Garden the Imphee seeds received from Dr. Balfour of Madras, in February last, and a portion of which was laid down in

March, have now come into full ear; this specimen differs much from those received from General Sir John Hearsey, as will be seen from the accompanying specimens forwarded for inspection. The Imphee appears to be the *Sorghum bicolor*, known by the natives under the name of [illegible]o-debdhan.

"The green dye plants of China, since the commencement of the rains, have taken a good start, particularly that of the cultivated kind, and as many branches of each tree as could be conveniently set down in layers have already been put down, and which I expect will yield a large number of plants about the end of the rains, when they may be safely removed for distribution. The wild growing *Rhamnus* have not yet taken a good start, but no doubt they will do so very soon, when they will likewise be at once layered off, so as to enable me to obtain a corresponding number of plants of both, as one without the other unfortunately fails to produce the dye.

"In conclusion I may add, as the season for laying out young grafts has already commenced, that there are now for distribution to members and non-members the following layers and grafts of fruit trees:—Of eighteen kinds of mangoes, 378 grafts; peaches 439; pumlows 253; limes and lemons 420; oranges of sorts 300; Desert and Nepal pears 70; guavas 100; litchees 20; eugenias 170; seedlings of loquats and sopatas 150, and a number of all kinds of flowering and ornamental shrubs, together with a collection of roses."

*Recommendations from the Council.*

The following recommendations from the Council were submitted:—

1. That the Society take the necessary steps to ascertain whether the surplus amount of the Dalhousie Testimonial Fund can be appropriated for the purposes of a Public Garden.

Agreed to, and *resolved* that the Secretary be authorized to place himself in communication with the Secretary of the Fund with the above object in view.

2. That the terms for which prizes were offered for certain quantities of cotton of certain descriptions, and which expired on the 31st December 1858, be extended to the close of the current year, due notice of the same being given.

Agreed to, and that the Special Committee be requested to revise the list of prizes offered for other objects.

*Experimental Silk Culture at Umritsur, in the Punjab.*

The subject that next engaged the attention of the Meeting related to an experiment on a small scale, recently instituted by Mr. H. Cope, at Umritsur, for the culture of the silk-worm. Two communications were submitted from

Mr. Cope, with two reports on the cocoons and one on the reeled silk. It was ordered that copies of these reports be sent to Mr. Cope for his information.

*Cotton from the Sonthal Pergunnahs.*

A communication was next read from Mr. P. Burke, from Koosma, *vid* Rajmahal, dated 12th May, respecting the muster of cotton alluded to under the head of presentations, and giving several useful particulars regarding the mode of cultivating the plant in the localities from which it has been obtained.

The Secretary intimated that cotton similar to the above had been previously sent to the Chamber of Commerce, and valued at 6*d*. per lb. The color is good, though the staple is rather short; but it would, nevertheless, probably prove an useful cotton for the English mills. He had sent to Mr. Burke a portion of the Pernambuco cotton seed recently received.

---

A long and interesting paper was submitted from Captain Thomas Hutton, entitled "Notes on the silk-worms of India," which was ordered for publication in an early number of the journal.

---

It was agreed, on the motion of the Reverend J. Long, seconded by Mr. Cantor, to send copies of the publications of the Society to certain of the leading Agricultural and Horticultural Institutions of Europe, and to invite correspondence and reciprocation.

For all the above presentations and communications the best thanks of the Society were accorded.

---

*(Wednesday, the 13th July 1859.)*

THE usual Monthly General Meeting was held on the 13th July 1859.

C. A. Cantor, Esq., Vice-President, in the chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen were elected Members :—

Messrs. E. L. Vincent; dward Grey, C. S.; Lewis Cosserat; George Palmer; S. C. Bayley, C. S..; and Dr. William Thomson.

The names of the following gentlemen were submitted as candidates for election :—

Major J. H. Blanshard, Landour,—proposed by Colonel R. Houghton, seconded by the Secretary.

Robert J. Richardson, Esq., C. S., Arrah,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Baboo Kaleekissen Mittra, Zemindar,—proposed by Baboo Digumber Mittra, seconded by Baboo Pearychand Mittra.

Captain W. F. Fagan, Commandant 7th Bengal Police Battalion,—proposed by Mr. C. F. Harvey, C. S., seconded by the Secretary.

G. H. Freeling, Esq., V. P. and Secretary Local Committee, Humeerpore,—proposed by the Secretary, seconded by Mr. W. Stalkartt.

Gregor H. Grant, Esq., Indigo Planter, Bhaugulpore,—proposed by Mr. Walter Landale, seconded by Mr. Thomas Grant.

Sir R. de L. St. George, Bart., Bengal Horse Artillery,—proposed by Dr. David Scott, seconded by the Secretary.

Mr. J. A. Pinheiro, Thaneysur,—proposed by the Secretary, seconded by Mr. Rose.

Captain A. P. Orr, Deputy Commissioner, Salone, Oude,—proposed by Mr. Rose, seconded by Mr. C. A. Cantor.

John Lemarchand, Esq., Barr,—proposed by Mr. Hartley Watson, seconded by the Secretary.

Lieutenant R. A. Sterndale, 2nd Police Battalion, Sasseram,—proposed by Mr. R. King, seconded by Mr. Rose.

C. W. Wilmot, Esq., Assistant Commissioner, Sonthal Pergunnahs,—proposed by the Secretary, seconded by Mr. Cantor.

The Rao of Bedla,—proposed by Captain R. M. Annesley, seconded by the Secretary.

Captain L. H. Irby, H. M.'s 90th Regiment,—proposed by Mr. Cantor, seconded by the Secretary.

E. S. B. Pereira, Esq., Assistant Engineer, Sonthal Pergunnahs,—proposed by the Secretary, seconded by Mr. Cantor.

Captain E. Thompson, Deputy Commissioner, Seetapore, Oude,—proposed by Mr. R. Berkeley, seconded by the Secretary.

John Gale, Esq., Pundoul factory, Tirhoot,—proposed by Mr. W. Stalkartt, seconded by Mr. Cantor.

R. W. Crump, Esq., Moujoul factory, Monghyr,—proposed by the Secretary, seconded by Mr. Rose.

---

The following contributions were announced :—

1. Selections from the Records, Government of Bengal, No. 30. Presented by the Government of Bengal.

2. Selections from the Records, Government of India, No. 25. Presented by the Government of India.

3. Madras Exhibition of 1859 on the Raw Products of Southern India. Presented by the Government of India.

4. Memoirs of the Geological Survey of India, Vol. 2, Part I. Presented by the Government of India.

5. Annual Report of the Superintendent of the Geological Survey of India. Presented by Professor Oldham.

6. Rapport de M. Natalis Rondot, Musee d'Art et d'Industrie de Lyon. Presented by the Author.

7. Journal Asiatic Society of Bengal, No. 2 of 1859. Presented by the Society.

8. Notes on the Hill Sanitaria of Western India. By John Chesson. Presented by the Author.

9. A Japanese Mat. Presented by Dr. D. J. MacGowan, Corresponding Member of the Society.

10. Two cocoons of an oak-feeding *Saturnia* from the Punjab. Presented by H. Cope, Esq.

The following is extract of a note from Mr. Cope on the subject :—

"I am informed that attention has been drawn in France by the Paris Society of Acclimatation to no less than three species of SATURNIA, feeding on the oak, and producing cocoons that yield useful silk. One is said to be from New Orleans, one from Southern India, and one from China. I do myself the pleasure to forward you herewith two cocoons recently communicated to me by Mr. D. F. McLeod, Financial Commissioner of the Punjab, and which are found on the oak, of which whole forests exist in the Kangra Hill district.' It is not likely that you may be able to compare it with any of those above alluded to, but you may be able to obtain some cocoons from China, and thus to establish their identity or difference, if any. I know that specimens have been sent by Mr. Reginald Saunders, the Deputy Commissioner of Kangra, to the Reverend Mr. Cave Brown of Subathoo, and I have hopes that zealous entomologist may be able to identify the species if it should be already known. In the meanwhile I hope to prosecute further enquiries, as the subject is one well deserving of attention."

*Resolved* that these specimens be sent to Dr. MacGowan, and his kind attention requested to the subject.

11. A small assortment of seeds from North America and the West Indies. Presented by Leonard Wray, Esq.

The following descriptive list is furnished by Mr. Wray of these seeds :—

*1st.*—The celebrated timber tree, the American "*Live Oak*," from South Carolina. Timber first class at Lloyds; will thrive well near Calcutta.

*2nd.*—Indian Corn. The true "*Shoe Peg*," grown on the Estate of General Hammond in South Carolina, and part of a crop of 61,000 bushels. Some acres yielded as much as 103 bushels, clean corn, each. This is a very

valuable maize for India, especially for the Upper Provinces; and should be carefully grown and then distributed.

*3rd.*—South African "Imphee," white "Enyama," *Holcus Saccharatus.* Excellent variety; sweet juice, and fine "grain."

*4th.*—"Ackee," an ornamental small tree, and a *delicious* vegetable, sometimes eaten raw, but generally *fried* together with butter and black pepper.

*5th.*—Fine Sea Island cotton brought by myself from the plantation of Mr. Chisholm. This cotton, when cleaned, is worth three shillings per lb., and generally used for lace making, being exceedingly fine and strong. (300 seeds sent).

*6th.*—The finest Jamaica "Gynep," much more luscious and pleasant than the leechee, upon which the "Gynep" might be "grafted."

*7th.*—*Sapodilla*, a well-known West India fruit.

*8th.*—The Devereux grape (black) from Alabama, one of the Southern States of America; a very hardy and nice grape.

*9th.* The South African "Imphee," or sweet reed (*Holcus Saccharatus* of Linnœus). This variety grows 16½ feet high, and the stalks weigh from 4 to 6lbs. each. A very good and sweet variety, juice marking 8 degrees Beaumé.

*10th.* The celebrated Carolina grape, "white Scuppernong," from which 2,000 to 3,000 gallons of fine wine per acre is made.

*11th.* American wild fruit "Persimmon" ("*Diospyros Virginiana*"). In my opinion a capital fruit when quite ripe, and I fancy very beneficial in cases of dysentery, &c., &c.

12. Specimens of a few drugs, fibres, cloths, munjeet, seeds, &c., from Upper Assam. Presented by Captain W. H. Lowther.

Extracts from Captain Lowther's letters, dated 20th and 30th May, respecting certain of these specimens, were read.

13. Specimens of flax raised in the Punjab. Presented by H. Cope, Esq. (Further particulars respecting this flax will be found in the body of the proceedings.)

---

The Council reported that, in accordance with instructions received at the last meeting, they had communicated with the Secretary of the Dalhousie Testimonial Fund in respect to the large surplus balance at credit of that fund: and had also submitted a proposal, copy of which they now laid on the table.

*Proposal by the Council of the Agricultural and Horticultural Society.*

The Council of the Society beg to propose that the surplus funds of the Dalhousie Testimonial, after defraying all calls upon them for Scholarships for the Civil Engineering College, be appropriated to the purchase and improve-

ment of a piece of ground in the suburbs of Calcutta for the establishment of a public Garden and Park to be called the "*Dalhousie Park.*"

The subject of the formation of a Garden in the immediate vicinity of the town, so as to be conveniently accessible to the public, occupied the earnest attention of the Society about seven years ago, when they assented to the appropriation of a considerable sum of money out of their capital towards so very desirable an object, but they were obliged to abandon it, not being able to obtain by public subscription a sufficiently large additional sum for the purpose.

In bringing forward this proposition, the Council of the Agricultural and Horticultural Society beg to point out that it has the advantage of providing additional funds besides those which will be supplied by the Dalhousie Testimonial. The Society's Garden could be incorporated with the proposed public Park without the smallest interference with the full use by the public of the Park and Grounds. The great part of the expense of the maintenance of the Park would therefore be borne by the Society, and a small sum, to be invested in public securities, would suffice for all the additional expense beyond that at present incurred by the Society for the support of its Garden.

In the event of the subscribers to the Dalhousie Testimonial entertaining the proposal for a public Park and Garden, and a sufficiently eligible site being found available, the Council of the Society will be prepared to undertake the management, and to recommend the application of a specific sum from its funds towards improving it. The Park and Grounds would of course be open to the public generally at all convenient hours and times, subject to the ordinary restraints against any abuse of the privilege.

---

A revised list of prizes for the current year was also laid on the table by the Special Committee, and ordered to be published on the cover of the Journal.

*Nursery Garden.*

The Officiating Gardener's Monthly Report was submitted, of which the following are extracts :—

" I beg to state, in continuation of my last monthly report, that I received a packet containing 160 kinds of Melbourne seeds from Dr. Thomson, Superintendent of the Botanical Garden, and a dozen shoots of two kinds of *Bromelia Ananus,* which were received from Mr. Thwaytes, from Peradinia, Ceylon, stated to be from an original stock from the West Indies. One species belong to the spineless Kuyan, which is a very well flavored kind. Also a packet containing eleven kinds of seeds, imported from England, from Mr. L. Wray.

"Of the seeds received from Dr. Thomson seven kinds of *Acacias* have already germinated, and a few other kinds, *viz. Callistemon rigidus, Dodonœa conferta* and *hexandra, Eucalyptus Obosa* and Murray Sps. and *Hardenbergia* and some others, all of which no doubt will be of great use for distribution to the Members.

"Of the eleven kinds of seeds from Mr. L. Wray, the two kinds of 'Imphee' or the South African *Sorgum Saccharatum* have germinated within forty hours very freely, one yielding an average percentage of 70 per cent. and the other about 95 per cent., but both varying from thes ix kinds of Imphee seeds received from Dr. Balfour of Madras, in January last. The species of Indian corn, called the 'Shoe Peg,' received from the same gentleman, and the seeds of Sea Island cotton, are very good and fresh seeds, as every seed has freely sprouted up within forty eight hours, yielding cent. per cent. The Imphee and the Indian corn seeds of this batch (after placing some in trial gumlows) were laid out in open ground in the Economic Garden, where they have likewise freely germinated.

"The seeds of the Assam Room species, received from Captain Lowther, were sown on receipt both in trial gumlows and open bed in the second kutcha nursery, and in both places it has freely germinated. The Madder seeds received from Mr. Cowell were on receipt laid out in the same way. The result I regret to say has proved very unsatisfactory, not a seed germinating. I would attribute this to the delay in transmission whereby its germinating properties were lost. The seeds of *Corchorus olitorus* and *Hibiscus sabdariffa*, received from Mr. H. G. French, have sprouted in open ground very favorably. The seeds of *Hibiscus* were supposed to belong to the species *Cannabinus*, but it is not so; the plant is the red sorrel.

"The Pernambuco cotton seeds, received in the beginning of April last, from Mr. Stewart Douglas, were laid down in trial gumlows immediately on their receipt, when an average percentage of 40 (as reported at the time) was obtained. Some of the plants which had then sprouted are still in gumlows, however the seeds received for sowing in open ground towards the second week of June were soon laid down after preparing the soil and top-dressing it in twenty lines with twenty holes, and in each hole four driblets and one seed to each driblet. At the time of sowing the seeds the weather, to all appearance, was very favorable, but within twenty-four hours a heavy shower of rain came on and inundated the place, which resulted in damping off the whole of the seeds. After the weather had dried, I re-dressed the same plot, and laid down another batch of seeds in the same proportion as the last, but I regret to state that, though in trial sowing it yielded forty per cent., in the present sowing of the entire plot only 262 plants have germinated, which therefore yields a return of about 8 per cent. only.

"The *Sorghum saccharatum* seeds received from Mr. Butler are now beginning to germinate, but I consider it unsatisfactory when compared with the seeds from Mr. Wray, as the average percentage is only about 40.

"In the orchard all operations for grafting, layering and gooting are progressing, though for cuttings in the kutcha 1st and 2nd nursery beds the excessive heat of the present oppressive weather is rather unfavorable, still much is being pushed on in this way, although so much work is not being done as would be performed in a more favorable season.

"In conclusion I beg to state that there are a few mango grafts and other fruit grafts of peaches, pummelow and assorted limes still available, as also about 200 plants of assorted vines. Several cuttings of the four kinds of sugar canes raised during the past season and forming a surplus stock can likewise be made available to members.

"Two plots of ground reserved for cotton seeds are now ready for sowing."

*Flax from the Punjab.*

The Secretary next read the following letter to his address from Mr. H. Cope of Umritsur, dated the 17th June, and submitted the samples of raw flax alluded to under the head of contributions :—

"I some time since informed you in a letter which, if I mistake not, was published in your monthly proceedings, that my house of business had, while the Dundee people were *talking* of what they would do, undertaken the purchase of the whole of the flax produce of the district of Sealkote. You are doubtless aware, ere this, that the proposed Flax Association has fallen to the ground for want of efficient support, and that I was justified in my allusion to the want of *action* on the part of the Dundee men, as I have more largely shown in the paper on the Introduction of Flax into the Punjab, I lately forwarded to you.

"I now do myself the pleasure of sending you herewith two samples of the flax now being manufactured by my Umritsur firm, in the district of Sealkote, and shall be obliged by your submitting the same to the next meeting of the Agri-Horticultural Society of India. Although the fibre from the acclimated seed is certainly superior to the other sample, it will prove beyond a doubt that good merchantable flax can be prepared from the country seed plant. I desire to draw the especial attention of yourself and the members of the Society to the *preparation* of this flax, which is carried out entirely by natives instructed by Mr. Laurenz Steiner, late Government Superintendent of the Flax operations, and who has, I regret to say, been compelled, by the state of his health, to return to Europe, leaving to our care a small staff of well-trained scutchers, whose labors show that natives *can* and *will* prepare flax in a careful and workman-like

manner. The out-turn will not be large, but sufficient to show what can be done."

Mr. W. Stalkartt, a Member of the Fibre Committee, submitted the following report on these samples :—

"*Flax from acclimated seed*—Is a decided improvement on any flax previously grown in this country on a large scale. It is of good length, and very strong; but a little harsh, and not very well cleaned.

"*Flax from indigenous seed*—Is also of fair quality, not quite so long and strong as the other, but cleaner, and not so harsh.

"Both very serviceable articles."

*Resolved* that a copy of Mr. Stalkartt's opinion be furnished to Mr. Cope. Further, that these samples be forwarded for report and commercial value to the Dundee Chamber of Commerce, who have already reported on Indian grown samples of flax.—(See Journal, Vol. IX., p. 379, and Vol. X., p. 220.)

---

Communications were also submitted :—

From the Right Honorable Sir Lawrence Peel, announcing that he had engaged the services of Mr. Thomas McMeekin as gardener to the Society, and that he would leave by the steamer of the 4th May (Mr. McMeekin arrived on the 20th June, and is now in charge of the garden in conjunction with Mr. Manuel, whose period of service expires on the 31st August).

*Resolved* that the best acknowledgments of the Society be communicated to the Right Honorable Sir L. Peel for his very kind attention to the Society's request, and the trouble he has taken in meeting it.

From the Honorable A. Eden, Deputy Collector of Baraset, reporting the failure of the Pernambuco cotton seed in the jail garden, and among those to whom he had distributed.

This report agrees, unfortunately, with those received from various other quarters, and with the open ground trial in the Society's Garden.

From H. Cope, Esq., a paper on the introduction of flax into the Punjab. Transferred for publication in the Journal.

From Messrs. James Carter and Co., of London, enclosing invoice of seed of field crops shipped per *Ida Zeigler* and *Tyburnia.*

From Messrs. D. Landreth and Co., Philadelphia, invoice of annual consignment of vegetable and other seeds, shipped per *Boston.*

---

(*Wednesday, the 10th August* 1859.)

W. G. Rose, Esq., Vice-President, in the Chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen were elected Members :—

Messrs. R. J. Richardson, C. S., G. H. Freeling, C. S., and Gregor H. Grant; Major J. H. Blanshard; Captain W. F. Fagan; Sir R. de L. St. George, Bart.; Baboo Kaleekissen Mittra; Messrs. J. A. Penheiro, John Lemarchand, and C. W. Wilmot; The Rao of Bedla; Captain A. P. Orr; Lieutenant R. A. Sterndale; Captain L. H. Irby; Captain E. Thompson; Messrs. E. S. B. Pereira, John Gale, and R. W. Crump.

The names of the following gentlemen were submitted as candidates for election :—

Francis Douglas, Esq., M. D., Civil Surgeon, Lucknow,—proposed by Dr. T. Cantor, seconded by Mr. C. A. Cantor.

Captain F. B. Forster, 5th Fusiliers, Allahabad,—proposed by Lieutenant W. Mackinnon, seconded by the Secretary.

J. T. Worsley, Esq., Deputy Magistrate, Nowada,—proposed by Mr. E. F. Latour, seconded by Dr. Thomson.

Andrew Ross, Esq., C. S., Azimghur,—proposed by Mr. C. N. Cooke, seconded by Mr. W. G. Rose.

E. Bonavia, Esq., M. D., Assistant Surgeon, Lucknow,—proposed by Mr. M. Wylie, seconded by the Secretary.

Wm. Wavell, Esq., C. S., Pooree,—proposed by Mr. J. J. Ward, C. S., seconded by Mr. G. F. Cockburn, C. S.

Major W. W. Anderson, (1st Bombay Lancers), Superintendent H. H. the Guikwar's Contingent of Horse,—proposed by Captain R. M. Annesley, seconded by the Secretary.

A. W. Roghé, Esq., Merchant, Akyab,—proposed by Mr. F. Schiller, seconded by Mr. W. G. Rose.

Baboo Dwarkanath Mullick, Calcutta,—proposed by Baboo Pearychand Mittra, seconded by Baboo Shibchunder Deb.

J. A. Loch, Esq., M. D., Civil Surgeon, Mirzapore,—proposed by Mr. George Loch, C. S., seconded by the Secretary.

Lieutenant C. N. Judge, Bengal Engineers,—proposed by Dr. Thomson, seconded by Mr. Cantor.

Alexander Hope, Esq., C. S., Beerbhoom,—proposed by Mr. O. W. Malet, C. S., seconded by Mr. Rose.

Dr. R. Pringle, Civil Surgeon, Pooree,—proposed by Mr. E. A. Samuells, C. S., seconded by the Secretary.

Colonel Vincent Eyre, C. B., Bengal Artillery,—proposed by the Secretary, seconded by Dr. Thomson.

Colonel Arthur Sanders, Commanding Raneegunge Depôt,—proposed by Dr. Cantor, seconded by Major T. Martin.

Dr. W. J. Mountjoy, Civil Surgeon, Akyab,—proposed by Dr. Mouat, seconded by Dr. Thomson.

Captain Charles Chamberlain, Oude Police,—proposed by Major G. W. Boileau, seconded by the Secretary.

R. P. Sage, Esq., Raneegunge,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

Thomas F. Kilby, Esq., Merchant, Calcutta,—proposed by Mr. Robinson, seconded by Mr. Rose.

George E. Evans, Esq., Curator, Geological Museum, Calcutta,—proposed by the Secretary, seconded by Mr. Rose.

---

The following contributions were announced:—

1. Administration Report for 1857-58, Part 1, with Appendices. Presented by the Government of Bengal.

2. Report of the Juries on the Madras Exhibition of 1857 (1 copy). Official and Descriptive Catalogue of the Madras Exhibition of 1857 (5 copies). Madras Exhibition of 1859 of the Raw Products of Southern India (5 copies) Presented by the Government of Bengal.

3. Lecture on the growth of Cotton in India, &c., &c., by Dr. Forbes Watson. Presented by the Author.

4. Second Annual Report of the Manchester Cotton Supply Association, and the Cotton Supply Reporter, Nos. 1 to 4 and 10 to 18. Presented by the Association.

5. Annual Report of the Konnugur Aided English and Vernacular Schools, for the year 1858-59. Presented by Baboo Sibchunder Deb.

6. A quantity (one seer) of Kangra Munjeet. Presented by H. Cope, Esq.

7. Two pieces of cloth dyed with Affghan and Kangra Munjeet, accompanied with a communication from Mr. Cope, dated 18th July.

The Secretary placed on the table two pieces of cloth dyed after the local process, one with a portion of the Kangra Munjeet received from Mr. Cope, the other with the Nepal Munjeet received a few months ago from Dr. Campbell: they are both inferior in color, especially the Kangra-munjeet-dyed specimen, to those received from Mr. Cope.

8. A sample of the "Black Jowar" of Berar [*Sorghum vulgare, var ?*]. Presented by Captain T. Davies, Superintendent of Police, Berar.

Captain Davies mentions that this grain is grown scantily in the neighborhood of Omraootee, and only for domestic purposes, and not for sale. Some grind it into flour and others roast it and eat it like the grains of maize.

9. A small assortment of seeds, brought from Europe, consisting of a

beautiful species of *Acacia*, the "Tree of Jerusalem;" a very fine species of Algerine haricot bean and of Athens pumpkin, apricot and greengage stones, Maltese and Naples cotton seed, &c., &c. Presented by James Cowell, Esq.

10. A few more cocoons of the oak-feeding *Saturnia* of the Punjab, of which some were submitted at the last meeting. Presented by H. Cope, Esq.

The following is an extract of Mr. Cope's letter on the subject:—

"I have the honor to send you, under separate cover, a few more cocoons of the oak silk-worm of the Kangra hills, from a number obligingly sent me by Mr. Reginald Saunders, Deputy Commissioner of the district. It is much to be regretted that all these cocoons are pierced, for they seem likely to yield a thread of some value, and I will do my best to obtain entire cocoons either this or next year. I should infer from the appearance of those now sent, that, unless they have undergone a very material change consequent on the exit of the moth, the silk would be much more easily wound than that of the common tussur, of which Mr. Saunders has also sent me a large quantity, and regarding which I hope to address you soon. Mr. Saunders has also most obligingly sent me eggs of the oak silk-worm and moths of both; but, unfortunately, they have suffered much in transit. As I know the moth of the tussur, I have been able to separate parts of the wings of the oak-worm, and find that it is also a species of SATURNIA, and I therefore still incline to the opinion that it may be found identical with some of the oak silk-worms mentioned in recent reports of the French Acclimatation Society as being found in Southern India and China. I shall try and rear the common tussur here this season, if I succeed in obtaining eggs from the cocoons received from Mr. Saunders, in which I failed last year."

The Secretary intimated that he had sent these and the previously received cocoons to Dr. MacGowan at Ningpo, for comparison with the oak-feeding *Saturnia* of China.

### *Nursery Garden.*

The Officiating Gardener's Monthly Report was submitted, of which the following are extracts:—

"I beg to state in continuation of my report for the past month, that I received a packet containing twelve kinds of fruit and vegetable seeds from J. Cowell, Esq., of which the Naples and haricot beans have freely germinated, as also the Carob, the enormous pumpkin, and the two kinds of cotton seeds—yielding an average per-centage of 100 per cent. The cotton seeds having germinated so freely, I have prepared a plot of ground to lay them out. The cotton seeds from Naples being a small quantity, and few in number, are laid out in two lines; but the Maltese cotton seeds are

set down in sixteen lines, and in about 300 driblets, yielding the same number of plants.

"I have again to report that the madder seeds presented by the above gentleman during the month of June last were laid out again about the middle of July, owing to the first sowings having proved a failure; and the second batch were laid out in the following manner :—

"In the trial gumlows.

"In two gumlows of 100 seeds in each, in the usual way.

"In No. 1 gumlow 100 seeds steeped in lukewarm water of 110° F.

"In No. 2 gumlow 100 seeds steeped in ditto of 100° F.

"And both kept for twenty minutes, after which a plot in the open ground was prepared after top-dressing properly, and laid out in three squares of 250 seeds in each. In No. 1 square in the usual way; in No. 2, steeping the seeds 110° F., and in No. 3 100°. Independently of these, I steeped 200 seeds in a very weak solution of ammonia, in which I kept 100 for a quarter of an hour, and the other 100 for half an hour; and in every attempt, as previously anticipated, the whole failed, not even one seed germinated.

"The seeds of the 'Black Jowar' of Berar, received from Captain J. Davies, being put in trial gumlows, have freely germinated 70 per cent.; such being the result, the rest of the seeds were laid down in four lines in the Economical Garden, where they have likewise sprouted up and are doing well.

"The bread fruit plants in two earthen pots were received from Mr. James Cowell in a very sickly state, and were carefully re-potted. Of the three plants two are sprouting out, and the other remains in its original state. The two sprouting show signs of a vigorous start, and I have reason to believe they will do very well.

"All the moutan or peony plants received from Mr. Fortune have of late suffered much, and I fear they have perished. This is much to be regretted, more especially as the plants in the beginning of the rains had taken a start, and I had then considered that I had gained much upon them, though I had little hope they would succeed at all in this climate."

The Gardener also submits the following account of losses sustained by the gale of the 26th July :—

"It is painful to record the heavy disasters caused by the gale of the 26th ultimo, in almost every department of the Garden; but the loss sustained in trees and fruits, both in the Orchard and Economical Garden, are very severe, and will take some time to repair. In the *Flower Garden*, besides the blowing down of the several bamboo bowers, with their plants, the severe loss has been in the injury which both *Amherstia* plants have suffered. They were shaken off from their very roots, and the

thirty-three layers put down a fortnight previously were one and all fairly uprooted, and where the adhesiveness was great, the injury sustained was by the branches being broken up from the place where the inarch was made, and both trees are now in such a state that it precludes the possibility of laying out beyond a few more branches. This was also the case in all the layers set in *Buginvillea spectabilis*, as also with the layers set from *Dombeya viberrnifolia.* One of the three plants of the *Chrysobalanus Icaco*, or the Cocoa-plum, has been lost. The *Echites suberecta* received a serious injury by being torn up from its very root, with the jaffree work to which it was trained.

"In the Orchard the loss has been a little severe. Two cocoanut-plants, of the Singapore stock, received from Joseph Agabeg, Esq., in 1849, were rooted up, together with two Areca or the betelnut-plants, from the same gentlemen, and received about the same time; besides several fruit trees, *viz.* three Bombay mango trees, one Madras mango, two Madras pummelows, five loquat plants, received from Mr. Emerson, which were imported from China direct, and several lime trees; twelve Avacado pears were also injured, and nearly 800 fruit in an unripe state, were blown from the trees, and also fourteen fine healthy bale trees. These are all at present propped up, and will in course of time recover from their present state.

"In the Economical Garden, all the late healthy plants of Imphee and Indian corn were levelled to the ground, some breaking down from their very roots, and about 432 plantain trees, with about 100 bunches of unmatured fruit.

"None of the houses have suffered in any way."

In connection with the above a recommendation was submitted from the Council, for disposal at the next Meeting, that a sum not exceeding Rupees 50 per mensem be allowed for the salary of an Overseer or Assistant Gardener for the Society's Garden.

*Experimental Silk Culture at Umritsur from Cashmere Stock.*

The Secretary next submitted the following communication from Mr. H. Cope, of Umritsur, dated 19th July, in reference to his previous letter, which was published in the proceedings of the June Meeting :—

"A recent distinguished writer has truly observed :—'The tree is kown by its fruit,' is a sound principle in science, and a cardinal doctrine in theology. *It is common sense.* It is general experience. I have seen, in a recent number of the *Indian Field,* a letter from Captain T. Hutton of Mussooree, impugning the correctness of my opinion, that the Cashmere stock of silk-worms was entirely free from disease, and giving his own reasons in support of what he advances. I have no time to enter on a controversy respecting the existence or otherwise of this disease, in the stock from whence my silk-worms, and the much-admired cocoons and silk they produced, were raised, nor do

I consider your Society a proper arena for controversies of any kind that involve, after all, mere matters of opinion. It is sufficient for me, and perhaps for that part of the public interested in the question, that the produce of my silk-worms (selected entirely at randon and of which I might subsequently have forwarded much better specimens) has been pronounced first-rate by most competent judges, and that I could, if necessary, adduce ample proof that the fine firm appearance of my worms bore undoubted evidence of the healthiness of my stock; but I am, in justice to my experiment, and to my former assertions regarding the sound condition of the insects I reared, bound to submit a few words to your Society (which has, as a body, and in the instance of many individual members, taken such an interest in my proceedings) regarding the series of disasters that befell the silk-worms obtained by Captain Hutton from the eggs I sent him, as from these disasters he infers that my stock must be tainted with disease. Every one conversant with the care required successfully to rear mulberry tree silk-worms, and the absolute necessity for securing to them an equable temperature, night and day, and during the whole period of their existence, will at once understand why Captain Hutton's experiment was so very unsatisfactory, when I mention, as he ought to have done, that a large portion, if not the whole, of the worms produced from the eggs I sent him, were fed on shrubs or trees IN THE OPEN AIR. It is, therefore, not to be wondered at, that many sickened and died, and that those few that did arrive at maturity, amid the inclemencies of an out-door education, were next to useless in regard to their produce. You will find in the Journal of your Society, that Captain Hutton has already, more than once, maintained that the open air feeding of silk-worms would be advantageous. Mr. Bashford has shown him his error in his remarks, and he now has a practical proof of it in *his* experiment, which appears to have utterly failed; while mine has, owing no doubt to a different plan of proceeding, been eminently successful. Captain Hutton has also omitted to mention on what kind of mulberry his worms were fed—a very material point. If the black-fruited mulberry leaf, then again I do not wonder at his failure. It is further not stated by him whether his worms were fed on trees, shrubs, or immature seedlings. When I said, in my previous communication to you, that 'I could not devote that attention to the feeding that silk-worms (the printer made it 'cocoons') undoubtedly require,' I had such attention in my mind's eye as was manifested by Count Dandolo and other such enthusiasts. I bestowed *much* attention, I examined the worms frequently, I always saw the food that was supplied to them, and, above all, the worms were never removed from one frame to another, except in my presence, so that I had a full opportunity of noticing the proportion of dead and weakly worms, which was, I still maintain, wonderfully small, and

such as would, I have no doubt, occur in the best-managed establishments where the disease was never known. Further, I made over a small quantity of my stock of eggs to Jaffer Alee of Dheria, who brought me part of the produce. He has reared silk-worms for twenty years. His opinion is, therefore, of value, and he was fully satisfied.

"I deem it, lastly, necessary to advert to one more point, *viz*. that, although I am perfectly certain the eggs I sent to Captain Hutton were sound at the time of despatch, they may, as the season was somewhat advanced, have suffered damage in transit, or from want of care after reaching him. A considerable portion of the *same stock*, forwarded by me to Calcutta to a foreign gentleman more thoroughly conversant with the rearing of silk-worms in all its branches, than Captain Hutton or I can possibly be, and who has a well-known breeding establishment in Italy, was by him considered of such unexceptionable quality, that he would have taken *maunds*, had they been available. My purchase of land, and entering on a considerable operation for next year's operation if I am spared, is the best proof I can afford of the sincerity of my opinion. The interest taken by the Agricultural and Horticultural Society of India in my experiment, and the importance of the subject, must be my apology for submitting this perhaps unnecessarily long letter, seeing how ample and decisive has been the Society's accord of my success, though I am thankful to Captain Hutton for the opportunity he has afforded me of enlarging somewhat on the subject. I am glad also to see, notwithstanding all his objections to my opinions, he considers me quite correct in regarding the Cashmere worm as a good and valuable stock, and that it is without doubt the finest mulberry BOMBYX in India. I am further happy to observe that Captain Hutton has come altogether round to my opinion on one point, and that he now believes the Cashmere and the Italian worms to be identical. I shall be happy to supply him in due season with eggs from my Umritsur stock, with ditto from Jaffer Alee's stock, originally derived from Cabul, and with some I hope again to obtain from Cashmere direct. He can then test the stock generally, but he must give it fair play, and not expose tender worms to open air dangers."

---

A letter was read from the Commissioner of Nagpore, requesting the aid of the Society in supplying him with a brush gin, as a model, with a view of spreading its use through the cotton-growing localities of that province. "There seems to be no doubt"—observes Mr. Plowden—"that if the cotton were properly gathered and cleaned, its value, from the combined effects of increased quantity and improved quality, would be very highly enhanced, perhaps as much as 50 per cent."

*Resolved*, that an application be made to the Government of Bengal for a few of the "cottage saw gins" (of which one is in the Society's Museum), which were forwarded by the Court of Directors in 1849 to the Government of India. [See Blue Book on East India Cotton, Part I., page 461, printed in August 1857.]

*Resolved* further, that in the event of these not being available, the Secretary be authorised to address the Manchester Cotton Supply Association for six of the machines in question, if now procurable, they being considered as about the best adapted for the purpose specified by the Commissioner of Nagpore; and that Mr. Plowden be informed of the steps taken by the Society to meet his application.

Read letters from the Secretary Cotton Supply Association, Manchester, and from Captain Hutton, Mussooree, returning thanks for certain publications of the Society.

---

*(Wednesday, the 14th September 1859.)*

W. G. Rose, Esq., Vice-President, in the Chair.

The proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected members .—

Dr. Francis Douglas; Captain F. B. Forster; Dr. E. Bonavia; Messrs. J. T. Worsley, Andrew Ross, C. S., William Wavell, C.S., and A. W. Roghé; Major W. W. Anderson; Baboo Dwarkanath Mullick; Dr. J. A. Loch; Lieutenant C. N. Judge; Dr. R. Pringle; Colonel Vincent Eyre, C. B.; Colonel Arthur Sanders; Dr. W. J. Mountjoy; Captain Charles Chamberlain; Messrs. Alexander Hope, C. S., R. P. Sage, Thomas F. Kilby, and George E. Evans.

The names of the following gentlemen were submitted as candidates for election :—

R. W. Bingham, Esq., Chynepore, near Sasseram,—proposed by Mr. F. Brine, seconded by Mr. E. DeCruz.

T. Dickson, Esq., Rampore Bauleah,—proposed by Mr. R. Blechynden, seconded by Baboo Peary Chand Mittra.

B. Healy, Esq., Bimlipatam,—proposed by Dr. Charles Palmer, seconded by Mr. W. Stalkartt.

N. C. Macnamara, Esq., Civil Surgeon, Tirhoot,—proposed by the Secretary, seconded by Dr. Thomson.

Lieutenant H. W. Garnault, Executive Engineer, Northern Hidgelee Division,—proposed by Dr. Cantor, seconded by Dr. R. H. Perkins.

Monsieur J. Perrin, Silk Filature, Berhampore,—proposed by Mr. J. Scott Elliot, seconded by Mr. S. P. Griffiths.

Lieutenant R. M. Skinner (56th N. I.), Adjutant Military Police, Allyghur,—proposed by Mr. J. S. Dumergue, seconded by the Secretary.

F. M. Halliday, Esq., C. S., Jessore,—proposed by Mr. Henry G. French, seconded by Mr. Thomas Brae.

Thomas Allen Wise, Esq., Donigara, Dacca,—proposed by Mr. C. A. Cantor, seconded by the Secretary.

Dr. A. A. Mantell, Civil Surgeon, Balasore,—proposed by Dr. Thomson, seconded by Mr. Grote.

M. Brodhurst, Esq., C. S., Saharunpore,—proposed by Dr. W. Jameson, seconded by the Secretary.

Captain J. R. Pughe (47th N. I.), Commandant Police Corps, Soory,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

T. F. M. Gennoe, Esq., Superintendent Benares Opium Factory, Ghazeepore,—proposed by Mr. R. Blechynden, seconded by the Secretary.

Captain J. C. Haughton, Superintendent Port Blair, Andamans,—proposed by the Secretary, seconded by Dr. Thomson.

Walter Bourne, Esq., M. D., Calcutta,—proposed by Mr. W. G. Rose, seconded by Mr. Cantor.

Lieutenant R. Boileau Pemberton (Bengal Engineers), Seetapore,—proposed by Major G. W. Boileau, seconded by the Secretary.

Major Barrow, C. B., Commissioner, Seetapore Division, Oude,—proposed by Major Boileau, seconded by the Secretary.

W. Shirreff, Esq., Jorada, Jessore,—proposed by Mr. George Macnair, seconded by Mr. W. G. Rose.

The following contributions were announced :—

1. General Report on the Administration of the several Presidencies and Provinces of British India during the year 1857-58, Part II., with Appendices. Presented by the Government of Bengal.

2. Madras Journal of Literature and Science, April to September 1858, Vol. IV., No. 7. Presented by the Madras Literary Society.

3. Report on the Government Botanical and Horticultural Gardens Ootacamund, for 1858. Presented by the Government of Madras.

4. Notes of an Excursion to the higher ranges of the Anamallay Mountains. Presented by Dr. Cleghorn.

5. The Annals of Indian Administration, Part II., Vol. 2. Presented by the Government of Bengal.

6. An Introductory Lecture to the Students of the Calcutta Medical College on the 15th June 1859. By Dr. Charles Archer. Presented by the Director General of Public Instruction.

7. A collection of Orchids from Rangoon. Presented by Captain E. H. Power.

8. A packet of Anemone Seed. Presented by Captain John Eliot.

9. A small quantity of seed of *Sorghum saccharatum,* from African stock. Presented by Lionel Berkley, Esq.

The following is extract of Mr. Berkley's letter respecting the above seed :—

"I may as well mention that a friend gave me a little seed of the African *Sorghum saccharatum,* which was sown last May in a piece of land 16 feet square. The crop was a very fair one, but not first-rate. The other day I expressed the juice from the stalks in a sugar mill, and obtained 16 seers of it. This boiled down gave 3½ seers of *goor* (coarse sugar). I think the plant, if grown better, would have produced more sugar.

"I send you some seed of the *Sorghum* grown in my garden."

10. Cocoons and eggs of a cross between the Cashmere annual and monthly Madrassee worm; eggs of Himalayan Eria (*Saturnia Canningi* Hutton); cocoons of *Saturnia Atlas,* and of another *Saturnia* which feeds on the Himalayan Oak (*Quercus incana*), and eggs raised at Mussooree from pure Cashmere stock.

The following extract of Captain Hutton's letter, dated 6th August, refers to the above :—

"I have this day despatched to your address a small banghy parcel containing a few cocoons, obtained from a cross between the ♂ Cashmere worm and the ♀ Madrassee. You will oblige me by obtaining an opinion as to the utility of pursuing the cross or not. I must tell you that these have been reared under the most unfavorable circumstances, for the purpose of ascertaining what the insects would actually bear in regard to damp and change of temperature. They were exposed to the full influence of the damp cold mists, which often beset us both by night and by day during the monsoon, and they were quite unprotected from changes of temperature, the thermometer suddenly varying between 70° and 78° ; doors and windows were purposely left open, so that although the insects were protected from actual rain, yet the mists often made the trays and leaves perfectly wet ; of course a good many died, but still the greater number struggled through, and these are some of the cocoons produced ; they are a fair average sample

and unpicked. If, however, this much can be done under such trying treatment, what might not be expected from protecting the insects from the damps and changes to which these were subjected? They are sent therefore simply that you may decide whether it would be worth while to cross these two species, for if the silk is neither improved in quality or quantity, nothing is to be gained by the experiment. In the same box at the top are three cocoons of the Atlas moth (*Sat. Atlas)*, and the others are the cocoons of the Oak *Saturnia*, which is very common both here and at Simla, and is easily reared. This is the species lately sent to you, I imagine, by Mr. Cope. The insect is well known and I have a number now feeding in the house. I doubt its being the Mantchouria species, but as I expect to hear soon from M. Guerin Meneville on the subject, I will then let you know. I sent a specimen to England some months ago, and shall probably soon receive the name of the moth. I should like an opinion on the silk of this also; there is, or ought to be, an inner cocoon, but I do not know whether this is the only part that can be unwound, or whether the whole can. I once unwound the inner cocoon in warm water like the mulberry cocoon, but I have not tried the outer coat. The moth is closely allied to the Tussur in some respects, and to *Actias* in others, and I do not yet despair of obtaining a cross between them. The Atlas feeds on *Falconeria insignis*, and appears to be easily reared; I have a few now feeding in the house. The silk appears strong, and from the appearance of the cocoons I should expect the thread to be easily reeled. Of this you can judge perhaps by the specimens sent, which are, however, far from being *first-rate.* Herein are a few eggs of the Cashmere worm reared at Mussooree.

"I will shortly, *D. V.*, send you a few cocoons of our Eria, which I think you may rear on the castor-oil plant, if your climate is not too hot for its constitution. Also a few of *Actias Selene.* I do not think this latter will yield sufficient silk to make it a valuable acquisition, but should such be the case, the insect could be reared in England, as it feeds both on the walnut and the wild cherry. Indeed, it is almost omnivorous. The true cocoon of the Himalaya Eria is oval, and within the long case, which must, I fancy, be removed before the silk can be unwound; this too will probably be the case with the Atlas cocoons. Our Eria is *Sat. Canningi* (nob.) figured in Cramer, Pl. 39, vol. 3, fig. A. Your Eria not being *Sat. Cynthia* of Japan, I propose to name *Sat. Eria.*

"The Punjab Tussur is the Bengal *S. Mylitta*, but I am yet puzzled about our Doon species. As soon as the Eria and Actias cocoons are ready I will write again."

In a subsequent communication of the 1st September, Captain Hutton offers a few more remarks respecting the oak-feeding *Saturnia* :—

"I sent down those cocoons to let you know that they were well known to Entomologists, whatever they may be to others. Captain Boys mentioned them many years ago, either in the *J. A. Society* or *Annals of Natural History*, as occurring in Kumaon, and I had long before that found them on the oaks at Simla and Mussooree. The Reverend Cave Brown and Mr. Wood at Simla had broods of them last year and this year, and I have had an immense number, as they can be bred easily either in the house or by putting a female out at night to entice a wild male. I wound off the silk some years ago in warm water only like the silk of *B. Mori*.

"The name of the moth I cannot yet tell you, though I soon expect to receive it from England, having sent home specimens of this and others some months ago. If found of use, it can be easily reared in the hills, though I doubt any body being able to rear it in the plains.

"You are right in saying that the Atlas cocoon approaches that of the Eria; the fact is, that the Atlas, the Bengal Eria, and our Himalayan Eria, together with a few others, form a distinct group, having the same general habits: they are allied in the egg, in the caterpillar, in the moths, and in the cocoons, as you will see by and bye, when I send you some further remarks on our silk spinners. This year Mr. Cave Brown kindly sent me some cocoons of the Punjab Tussur, which is the same as the Bengal species, and evidently *Sat. Mylitta*. From the moths I procured a brood with some difficulty, and can trace no difference whatever between the caterpillars and those of the Doon species; but when we come to the cocoon the distinction is at once apparent, and the moths likewise differ.

"And now a word on *Bombyx Mori*, if such indeed it be; the eggs of your annual or *Boro poolo*, which were laid on the 21st and 22nd March last, and transmitted by you to me, and which I said were diseased, commenced hatching *this* day in a temperature of 70°, thus corroborating my former statement, that it gives two broods within the year in our climate. The eggs sent by you at a later date, and which were pronounced to be diseased by the Italian Count, and which I likewise declare to be so, have this day also produced *one* caterpillar. I doubt if many of them will be prolific however.

"The eggs obtained from the cross Cashmere and Madrassee remained in *statu quo* for twenty-one days, *i. e.* from 10th to 31st August, and I thought the annual worm had proved too strong for the Madrassee, and that all had returned to annuals; but yesterday two worms came forth for the purpose I suppose of keeping me on the *qui vive*. I do not believe anything will ever

be gained by crossing. If the Cashmere annual and your *Boro poolo* are the same species, why does not the former hatch now also and give two broods? They are in the same climate, and the eggs are not in the same unhealthy condition as those from Bengal.

" It is a curious fact that eggs obtained from a cross with male *B. Huttoni* and female Cashmere are quite unprolific; and eggs procured from male Cashmere and female *B. Huttoni* are nearly as bad; a few out of hundreds hatched, but retain all the characteristics of the wild species; many are unprolific, and some appear to have become annuals like the male."

The Secretary stated he had lost no time in sending off these three kinds of eggs to Mr. Turnbull, of the Radnagore filatures, who had kindly promised to attend to them. It was agreed that the cocoons be also confided to Mr. Turnbull's care. Those from the cross breed were considered superior to the common Madrassee.

11. A small muster of Neilgherry Munjeet. Presented by Dr. H. Cleghorn.

" The Neilgherry Munjeet, the produce of *Rubia tinctoria*," observes Dr. Cleghorn, " is abundant on the higher slopes of these mountains. This indigenous dye is used to a considerable extent by the Badaga tribe, whose crimson-striped cloth is colored with this root, but I cannot learn that the article is exported for merchandise, although one or two smaller consignments are said to have been sent to Europe. Messrs. Flynn and Co. of Madras applied to me for a quantity of the root, and prepared a cake of a carmine color, which produced satisfactory results. I am desirous to learn the opinion of Mr. H. Cope as to the identity of this with Punjab Munjeet. This twiner grows most luxuriantly in all the hedgerows about Ootacamund, and on the slopes down to Wynaad (3,000 feet), so that the root is procurable at the simple cost of cooly hire. I observed that the roots are larger and redder at the greater elevation, becoming knotted and duller as the altitude lessens. I will be happy to obtain for you a larger quantity of the stem and root and to answer any questions regarding it."

12. Samples of kupass and clean cotton raised in the Soonderbunds from Mexican cotton seed, being portion of the supply received by the Society from the Manchester Commercial Association. Presented by L. Tiery, Esq.

Mr. Tiery furnishes the following statement of his experimental cotton cultivation:—

" With reference to the Mexican cotton seed I received of your Society in October 1858, I beg to state, for the information of the Society, the result of my experiment. I sowed about 50 beegahs of land in the same month, but the heavy storm in the end of that month, which lasted in the Soonderbunds for about three days, caused the river to rise so high as to break some parts of the embankments and to overflow the lands, by which the whole of

the seedlings were destroyed. After the storm was over I sowed again the seed that was left, about 5 seers, on a beegah of freshly cultivated land. The plants thrived well, the pods commenced bursting from the beginning of April, the cotton was picked up to June last, and the plants look healthy, with fresh pods at present. The quantity of cotton gathered from the beegah of land is about 4 maunds. I send you 2 seers of the said cotton as sample for the inspection of the Society. This year I am trying the Sea Island cotton seed, and the result of which I shall not fail to let you know."

This cotton was referred to the Committee for report.

Three fine healthy plants of *Œschynanthus* in flower from the Botanic Garden were placed on the table, two of *Œ. grandiflorus*, and one, a new kind, from Singapore.

*Proposed introduction of the Quinine-yielding Cinchonas into India.*

The Secretary read the following correspondence on the above important subject :—

" To A. H. Blechynden, Esquire,

*Secy., Agrl. and Hortl. Society, Calcutta.*

*Dated Council Chamber, the 23rd July* 1859.

Sir,—With reference to the correspondence noted in the margin, relative to the introduction into India of the Quinine-yielding Cinchona tree, I am directed by the Governor-General in Council to state for the information of the Agricultural and Horticultural Society, that Her Majesty's Government have determined upon deputing a confidential Officer to South America to make a collection of the seeds and plants, and convey them to Calcutta, Madras and Ceylon.

Home Dept.

From, 28th August 1857.
To, No. 1644, dated 7th November 1857.
To, No. 1044, dated 23rd April 1858.

2. Meanwhile Her Majesty's Government have desired that information may be collected as to the best locality for planting the Cinchonas in this Presidency; and I am directed to request that the Agricultural and Horticultural Society will favor the Government with their opinion on this point, together with any other observations which they may deem useful, respecting the cultivation of the Cinchonas in India.

I have, &c.,

W. Grey,

*Secy. to the Govt. of India.*"

"To W. Grey, Esq.,

*Secretary to the Government of India.*

Sir,—I am directed by the Agricultural and Horticultural Society to acknowledge the receipt of your letter of the 23rd ultimo, intimating that Her Majesty's Government have determined on deputing a confidential Officer to South America to make a collection of seeds and plants of quinine-yielding Cinchonas, and conveying them to Calcutta, Madras, and Ceylon, and requesting information from the Society as to the best locality for planting the trees in this Presidency, with any other observations that they may deem useful respecting the cultivation of these species of Cinchonas in India.

2. In reply I am directed to state that the requisites for the successful cultivation of these valuable plants appear to be a moist and equally temperate climate. Frost and snow and dry heat are to be avoided. For this reason the localities in this Presidency best adapted for attempting their culture appear to be those already enumerated in the fourth paragraph of my letter of the 28th August 1857, namely, the hills near Darjeeling, or say Sikhim, the Khasyah hills, the mountains beyond Chittagong, the hilly parts of Upper Assam, the Tenasserim Provinces; and in Southern India, the Neilgherries and the high elevation of the Western Ghauts.

3. The Society, I am directed to observe, are scarcely in a position to offer any *practical* observations in regard to the second point adverted to in your letter under acknowledgment. They would, however, venture to submit the few following remarks, which, if acted on, may, they conceive, lead to the successful introduction and cultivation of the plant in India.

*First.*—It would be very desirable so to time the despatch of the plants and seeds from their native country as to reach India at the commencement of the cold season. The recommendations contained in Dr. Falconer's paper (*Journal of the Agricultural and Horticultural Society*, Vol. VIII., page 16), in respect to the mode of despatch of seeds and plants are, the Society think, well worthy of adoption.

*Second.*—It would be further desirable, the Society conceive, to act on the suggestions of the late Mr. Piddington, as detailed in his memorandum published in the Society's Journal (Vol. X., page 140); more especially those parts which relate to soil and climate, as enumerated under sections A to D of the memorandum in question.

*Third.*—The proposal in the minute of the Right Hon'ble the Governor-General (Vol. X., page 144), namely, 'that Officers possessing the requisite botanical and geological knowledge should be deputed to enquire as to the

sites best calculated to receive the plants; that these Officers, duly supplied with all aids and appliances, should receive the plants upon arrival, and convey them to the selected spots,' appear to the Society also worthy of adoption, with the view of giving this interesting and important experiment a full and fair trial.

*Fourth.*—The best and most reliable information, as respects the cultivation of these trees in their native climate, is to be found, the Society believe, in Weddell's *Histoire Naturelle des Quinquinas.* This information, modified according to circumstances, will doubtless prove very useful to those Officers who may hereafter be entrusted with the superintendence of Cinchona plantations in various parts of India.

I have, &c.,

(Signed) A. H. BLECHYNDEN,

*Secretary, A. and H. Society.*

*24th August* 1859."

*Communications on various subjects.*

The following letters were also submitted :—

1. From C. E. Chapman, Esq., Bijnore, bringing to notice the districts of Bijnore and Rohilkund, as well adapted, in his opinion, for silk cultivation :—

"How is it that no effort is made to introduce silk cultivation in this and the adjoining district of Rohilkund? The climate of Bijnore is very similar to that of Rajshaye and Moorshedabad. There is little or none of that excessively dry heat which was evidently the cause of failure at Lahore, and many other parts of the Punjab. There can be no doubt, I think, of this being a congenial climate for the silk-worm, and the mulberry grows luxuriantly. Had I been going to stay here, I should have made an experiment. There is no reason, I believe, why silk should not be produced as abundantly here as in our lower Bengal districts."

2. From J. Naesmyth, Esq., Deputy Commissioner of Goordaspore in the Punjab, dated 18th August, announcing the presentation, to Jaffer Ali, of the silver medal and parchment certificate awarded to him by the Society for his successful attempt at silk culture, and for his having been the first to plant mulberry trees in that district for the sole purpose of rearing silk-worms. "They were duly received," writes Mr. Naesmyth, "and I have this day had the pleasure of handing them to Jaffer Ali in behalf of the Society in the presence of a considerable assemblage of people. I gave notice throughout the district, that as many persons as desired, or were interested in such matters,

might be present, especially among the Cashmeeries, who chiefly attend to silk-worm rearing, &c. The recipient fully appreciated the distinction, which will, I have no doubt, have a very beneficial effect, and serve '*pour encourager les autres.*'"

3. From H. Cope, Esq., enclosing extract of a letter to his address from Monsieur Perottet, of Pondicherry, regarding the oak-feeding *Saturnia* of the Himalaya :—

"When I received the oak silk-worm cocoons from Mr. Saunders, of which I sent you several specimens, I wrote to Monsieur Perottet of Pondicherry, enclosing two cocoons, to ascertain whether they might be identical with those he had discovered in his neighborhood. I am now favored with his reply, which I do myself the pleasure of communicating to your Society, as it is very desirable to place on record all detailed notices regarding the silk-producing worms of India. I hope to obtain entire cocoons of the oak-feeding worms, which shall be sent you, the more especially as I do not agree with Monsieur Perottet in his opinion of the cocoons, which he has seen under very unfavorable circumstances, being pierced and much crumpled. His notices of the progress of silk-worm rearing is interesting, and should prove that, with due precautions, any amount of silk may be reared in any part of India where the mulberry will thrive.

"*Translated Extract.*—The larvæ that spun the two cocoons that you sent me is certainly not the same as that which I communicated to the Imperial Zoological Society of Acclimatation, and which feeds on quite a different tree. It belongs, without a doubt, to some other species of BOMBYX or SATURNIA. It is possible it may be the same as those which feed on the oak in China, but it is impossible for me to make any assertion on the subject, as I have seen neither of them.

"I may, however, say, judging from the present aspect of the cocoons, that they could hardly be wound to advantage, or that it would be worth while to domesticate them, as on the one hand the cocoon is too light, that is, poor in regard to quantity; and on the other, that, not being entire, it could not be reeled in the same manner as the cocoon obtained from the BOMBYX *Mori*. I may, however, be wrong, as the cocoons you sent me were not in a condition to admit of my giving an authoritative opinion. It is possible that the long cocoon is closed at both ends, and that, if reared under favorable circumstances as to food, &c., the result would be more satisfactory.

"The worms that are found wild here, and which are now domesticated, belong to two different genera of BOMBYX. The cocoon of the one is very rich, yielding an elastic silk of great strength; while the other is much less

productive, and cannot be reeled, but contains an excellent silk, of which fabrics of great strength and durability could be made.

"It seems that your climate is fine, and peculiarly suited to the culture of the silk-worm and the cultivation of the mulberry. We are not so highly favored here, but we produce magnificent silks which sell at high prices, equal to those obtained for the silk of the south of France. I am anxious to obtain some eggs of your stock, which are probably annual. If you can send me a small quantity you would do me a service."

4. From Lionel Berkley, Esq., a few remarks on the culture of cotton from exotic seed at Delhi.

"I see from your report in the papers that the Pernambuco cotton seed has generally been a failure, and that you have raised very few plants in the Society's Garden. The seeds you sent me were sown at two different times. The first, owing to the long drought which succeeded (soon after it was put in), entirely failed. The second batch was sown a fortnight later, after the land had been moistened by a fall of rain. I got from it upwards of 1,500 strong plants. Most of them are 2 feet high, are growing vigorously, and promise well. The New Orleans cotton seed germinated much better than I had expected. I have some 3 acres of it. The plants are healthy, and in full flower and pod. I distributed three-fourths of this seed amongst the tenants in the district, and hear that in several places, where it was sown with ordinary care, it has succeeded. There is no doubt that American cotton can be introduced with great advantage in this country, and the people would cultivate it willingly if they had a ready sale for it. At present they say they cannot sell it, as native purchasers prefer the Indian kind. I have also an acre of Mexican cotton, the seed of which was supplied by Dr. Jameson. I never saw any plant take better to the soil, and grow at the rate this has done. It was sown three weeks later than the New Orleans, and has quite out-grown it. The plants are nearly double the size, and in full bloom and pod.

"The yams you kindly sent have all come up and are flourishing. So are the under-ground nuts; but the cork oak and China seeds have failed. I have reserved a few of the latter for trial next month."

5. From A. Grote, Esq., presenting a paper by Colonel James Abbott, entitled *On the Undeveloped Resources of India.* (Transferred to the Committee of Papers.)

6. From Baboo Hurrymohun Mookerjee, submitting the first part of a little Manual in Bengali, entitled *Krishi Durpun,* and soliciting the Society's patronage thereto.

*Resolved*—On the recommendation of the Council, that the Society grant the author Rupees 50 as a donation for this first part, he placing ten copies at the disposal of the Society. It was further agreed, as suggested by the Council, to recommend that the second part be written in a style that may be more generally understood by the ryot class, and that the price of the first part, which is fixed at one Rupee, be reduced.

7. From James Cowell, Esq., offering to write, by the next steamer, to his agents, Messrs. Salavy, to procure from a celebrated seedsman at Marseilles 4 or 5 lbs. of Madder seed of the October gathering, to be forwarded by the first steamer leaving with the November Mail. "We should get the seed here in December," adds Mr. Cowell, "and if it should again fail, which I do not think likely, we must give up the matter in despair."

The best thanks of the Society were tendered to Mr. Cowell for his kind offer, which was unanimously accepted.

8. From the Under-Secretary, Government of Bengal, intimating that there are not any saw-gins in the arsenal of the kind applied for by the Society in reference to the application from the Commissioner of Nagpore.

The Secretary stated he had addressed the Secretary Manchester Cotton Supply Association on the subject by the last mail.

9. From the Under-Secretary Government of India, applying for a quantity of foreign cotton seed of certain kinds for trial by the Superintendent of Forests in the Pegu and Tenasserim Provinces.

The Secretary announced that this application had been partially met.

10. From the Superintendent of Forests in the Pegu and Tenasserim Provinces, applying for China green-dye plants:—"The introduction of the *Rhamnus* yielding this green-dye," observes Dr. Brandis, "would be a matter of great importance in Burmah, where dyeing is practised in every village. At present green is obtained only by using Indigo with *Curcuma*. The desire to obtain a green dye for their own use would probably induce the natives to cultivate themselves; and if the price remains high in the European market, cultivation once begun would soon increase."

The Secretary intimated that steps were being taken to meet this request.

11. From Colonel C. J. Riddell, C. B., Commanding Royal Artillery in Oude, applying for vegetable and flower seeds for the gardens to be established, during the approaching cold season, by the soldiers attached to the batteries of Royal Artillery in Lucknow, Seetapore, Roy Bareilly, and Fyzabad.

*Resolved*—That as large a quantity of seed as can be conveniently spared be furnished at cost price.

The Secretary having mentioned that the Manager of the N. W. Dâk Company had again offered to send these cases of seeds free of cost, the best thanks of the Society were directed to be given to Mr. Allen for his liberality.

12. From Malchus Agabeg, Esq., applying for the loan of the "Cottage Saw-gin" and Mather's "Roller-gin" for a short time, to clean a quantity of cotton raised in the Soonderbunds from foreign seed, received last year from the Society. Complied with.

13. From Baboo Nobinchunder Doss, Secretary Local Committee Public Instruction, Baraset, reporting on the assortment of seeds received last year from the Society for the Baraset Garden. The seeds of vegetables succeeded generally, but those of field crops altogether failed.

14. From Messrs. C. M. Villet and Co., advising despatch of consignment of vegetable seeds per *Gondola.*

15. From Messrs. James Carter and Co., intimating the transmission, per overland steamer, of the first half of the quantity of flower seeds ordered by the Society for Mofussil subscribers. (The other moiety for town subscribers is expected by the next steamer.)

16. From Messrs. Wattenbach, Heilgers and Co., dated 3rd September, intimating that the "*Ida Zeigler*" has put into Rio de Janeiro, and cannot be expected to arrive before two months.

(The *Ida Zeigler* left England in the early part of April, with the Society's consignment of seeds of field crops. It is feared that these seeds will arrive too late in the season to be of any use.)

17. From Mr. R. Scott, of the Botanic Garden, dated 14th September 1859, respecting his trial sowings of the American and Cape vegetable seeds recently received:—"I am unable to send you, just now, a complete return on the value of the American and Cape of Good Hope vegetable seeds of this season; there are three kinds of American, and nine kinds of Cape seed, which have not yet germinated. I may add that I consider the American and Cape seeds of this season equal in quality to receipts of former years. So far the American seeds of this season have given a maximum of 96 per cent., minimum 4 per cent. Cape kinds, maximum 94 per cent., minimum 10 per cent. After I have completed the trial I will send you all the details."

For all the above communications and presentations the best thanks of the Society were accorded.

*(Wednesday, the 19th October 1859.)*

Dr. Thomas Thomson, President, in the Chair.

The proceedings of the last Meeting were read and confirmed.

The following gentlemen were elected Members :—

Messrs. R. W. Bingham; T. Dickson; B. Healy; Dr. N. C. Macnamara; Lieutenant H. W. Garnault; Monsieur J. Perrin; Lieutenant R. M. Skinner; Messrs. F. M. Halliday, C. S.; T. A. Wise; M. Brodhurst, C. S.; Dr. A. A. Mantell; Captain J. R. Pughe; Captain J. C. Haughton; Dr. Walter Bourne; Lieutenant R. B. Pemberton; Major Barrow, C. B.; Messrs. T. F. M. Gennoe, and W. Shirreff.

The names of the following gentlemen were submitted as candidates for election :—

Dr. John Sutherland, Civil Surgeon, Patna,—proposed by Mr. R. King, seconded by the Secretary.

N. Brice, Esq., Dinapore,—proposed by Mr. L. Balfour, seconded by Mr. W. G. Rose.

W. J. Broncke, Esq., Indigo Planter, Dheree,—proposed by Mr. B. R. Landale, seconded by the Secretary.

Dr. J. A. Guise, Civil Surgeon, Moorshedabad,—proposed by the Secretary, seconded by Mr. J. S. Elliot.

H. A. Porteous, Esq., Akyab,—proposed by Dr. W. J. Mountjoy, seconded by Mr. R. Blechynden.

Dr. Neville Jackson, Civil Medical Officer and Sub-Assistant Commissioner, Sumbulpore,—proposed by Dr. R. Perkins, seconded by Mr. C. B. Stewart.

Dr. Thomas John Morris, of Akyab,—proposed by Captain F. W. Ripley, seconded by the Secretary.

Carl Schultz, Esq., Singapore,—proposed by Mr. A. Walker, seconded by Mr. J. S. Elliot.

Captain J. Bean, Cantonment Magistrate, Rawul Pindee,—proposed by Captain H. C. Johnstone, seconded by the Secretary.

R. Duncan, Esq., Howrah,—proposed by Dr. C. Palmer, seconded by Mr. John Brown.

---

The following contributions were laid on the table :—

1. Annual Report on the Sind Forests—1858-59. Presented by Sir Bartle Frere, Commissioner of Sind.

2. Journal of the Royal Asiatic Society of Great Britain, Vol. XVII. Part 1. Presented by the Society.

3. Journal of the Asiatic Society of Bengal, No. 3 of 1859. Presented by the Society.

4. Returns of the extent of land cultivated with cotton in Sind in 1858-59. Presented by the Commissioner of Sind.

5. A small collection of botanical and horticultural works. Presented by Captain W. H. Lowther.

6. Four large samples of cotton raised in Pegu from foreign seed supplied by Government. Presented by Colonel Phayre.

Captain H. N. Davis, the Personal Assistant to the Commissioner of Pegu, in forwarding the above cotton, encloses certain memoranda from Dr. Brandis, Superintendent of Forests, Mr. Leeds, Deputy Superintendent of Forests, and Captain M. Lloyd, Deputy Commissioner, Tharawaddy, regarding the mode of culture, produce, &c. The samples from the two latter gentlemen are pronounced by the Committee (Messrs. Cowell and Manickjee Rustomjee) to be so much mixed, that they are unable to offer an opinion on them. The sample raised by Dr. Brandis from Upland Georgia seed is considered a superior cotton, such as is now fetching Rs. 14 per maund in the Calcutta market. It is also deemed a useful cotton for the home market,—" and if it can be produced," observes Mr. Cowell, " at a reasonable cost, say Rs. 10 or 11 per maund of lb82 English, it will pay in the European markets at low rates of homeward freight." Mr. Cowell adds that he cannot speak so well of the other cotton raised by Dr. Brandis from Egyptian seed ; " it is discolored and appears to me to have been grown and gathered under unfavorable circumstances. The staple is not of the usual length, and it is somewhat harsher in feel than the cotton of the parent country."

7. Two musters of cotton raised at Delhi from foreign seed. Presented by Lionel Berkeley, Esq. (Referred to the Cotton Committee.)

The following is an extract of Mr. Berkeley's letter, dated 29th September:—" The New Orleans is from the seed supplied by you, and the Mexican from that by Dr. Jameson. The plants are yielding well. I think a little later the cotton will be better still. The Pernambuco is only coming in blossom and will not be ripe for another six weeks. If you think the specimens are fair and will stand competition, I will send the kind most approved of. I asked the opinion of a gentleman who brought out some American cotton of first quality from Liverpool, and he thinks my Mexican cotton equalling it in every respect. I have not spared expense or trouble in the cultivation, and I think it may repay me in some way. I am certain most of the American cotton will grow well in this country with no more trouble or care than the indigenous crop. I think the second picking will produce better cotton still. The early pods are not so large as the late ones."

8. A few tea plants from the Tenasserim Provinces. Presented by the Government of India.

In sending these plants the Government forward a letter to the address of the Commissioner of the Tenasserim and Martaban Provinces, from Major S. R. Tickell, Deputy Commissioner of Province Amherst, of which the following is an extract :—

"I am not sufficiently versed in the subject to pronounce whether the tea is of a species which would repay the cost of cultivation : but the plants are very common here and indigenous, and would require very little tending. The people of this country drink an infusion of the green leaf only. About Ava the leaves are dried in the same way as in China, and the tea thus prepared is preferred by the Burmese of the Upper Provinces to that imported from China. A small quantity is brought *viá* Rangoon to Moulmein, and is also much liked by the Talyngs. The Burmans have not, however, the art of drying the leaves in the same perfection as the Chinese, and a fair comparison cannot, in consequence, be made of the produce of the two countries."

The Gardener reports, that of the twenty-three plants received in the Garden, fifteen are alive, and eight dead.

The President mentioned that the plants in question are so young that he could not speak with any confidence as to their being tea. It appeared to him that there are two distinct plants among them, one probably an *Eurya*, the other very like China tea. It would be necessary to have flowering specimens to enable him to form a decided opinion.

It was agreed to apply for larger and flowering specimens of these plants.

9. A sample of *Goor* from the South African 'Imphee' plant *(Sorghum saccharatum ?)*. Presented by H. C. Erskine, Esq., of Elambazar.

10. Specimens of two roots found in the hills of that part of the Kangra district which borders on Chumba. Presented by R. Saunders, Esq., Deputy Commissioner of Kangra.

"The name given to No. 1 specimen," writes Mr. Saunders, "is *Kooth*, and to No. 2 specimen *Thooth*. I am informed that one if not both of these roots finds a ready sale in the native bazars of this country, and is exported to Europe. I shall be obliged by your furnishing me with the English and botanical name for each specimen, and the uses to which they are respectively applied. Should the roots in question be of any considerable value as an article of export for foreign markets, perhaps some further notice should be taken of them. Any information you may be able to supply regarding them will be useful."

The Secretary mentioned that specimen No. 1 is the root of a Composite plant growing largely in Cashmere, and first botanically described

by Dr. Falconer, who named it *Aucklandia Costus*. In the Calcutta and Bombay markets it is known by the name of putchuk, and exported principally to China, where it is used as incense in temples, and also medicinally. The quantity collected annually in Cashmere is stated to be very large, about two millions of pounds. The export of putchuk from Calcutta has increased considerably during the last twenty-five years. In 1829-30 the export to China and the Straits did not exceed 300 maunds, valued at Sa. Rs. 3,100. In 1837-38, 6,700 maunds were exported, valued at nearly a lakh of rupees. In 1845-46 there was an unusually large export of 14,370 maunds, valued at Rs. 1,15,247. Since then to the present time the export has varied considerably, ranging from 2 to 10,000 maunds annually, valued at from Rs. 15,000 to 70,000.

Specimen No. 2 (which Dr. Thomson believes to be the root of *Salvia lanata)* is also common in Cashmere, where it is used to adulterate putchuk.

11. A plant of *Andropogon Iwarancusa*. Presented by H. Deverell, Esq.

12. A large quantity of maize raised at Chowparun from American stock, fully equal to the original. Presented by C. E. Blechynden, Esq.

The following is an extract of Mr. Blechynden's letter regarding the culture of this maize:—"The ground was first well ploughed and manured; the seeds were sown in the middle of June a cubit apart, the rows being the same distance. When the plants were 18 inches high, I ran a plough drawn by men through the rows, and when the ears began to dry in the beard, I cut the flowering heads off. I had 900 plants, which yielded me 1,200 ears or cobs. The produce here from native seed is about one-half from the same number of plants, namely, 40 maunds against 80 maunds per beegah. The natives are very anxious to get the seed, which I intend distributing among them. The suckers from these plants were very numerous, yielding a large amount of fodder for my bullocks and cows."

13. Three samples of fibres of sorts from the Palamow district. Presented by W. R. Pringle, Esq.

The following is Mr. Pringle's description of these fibres:—

"*First.*—The 'Purrass' [*Butea frondosa*] is universally used by the people here and parts of the Behar district for tieing the roofing of their houses, where it lasts several years, and as tiles *(khaprails)* are used for covering the houses, they have no occasion to repair or change for at least ten years. The *Purrass* does not stand the exposure to sun or rain, in either case it decays very soon.

"*Second.*—Mowlaney [*Bauhinia Vahlii* W. and A.] This is used in all cases where much strength and expense are requisite, such as drawing water from wells for irrigation, tieing cattle, &c., &c. It lasts a long time and is

not affected by wet. This is the fibre of a hill creeper, and grows to a great length, and is pulled before the branch withers or dries; it may be taken off to any length the branch may be.

"*Third.*—Anguer [*Hardwikia binata*]. This is used much in the same way as the second, but more generally for casting and carrying weights, as it does not stretch after the first use. It is the fibre of a large tree taken from the young branches: the wood of this tree is also much used, being hard and very like *Sissoo.*"

*Wild and Cultivated Silk.*

Several communications on the above subject were submitted from Captain Hutton, Messrs. Turnbull, Cope, and Pringle, and from the Government of India, *viz* :—

1. From C. S. Turnbull, Esq., Superintendent Silk Filatures, Radnagore, dated Ghattal, 1st October, reporting as follows on certain cocoons, wild and cultivated, which were received from Captain Hutton and laid before the last Meeting, and sending specimens thereof:—

"I have been unable to reply to your leters of the 15th and 21st ultimo earlier, and have now the pleasure to report on the cocoons sent, which I will do separately.

"*Cross between the annual Cashmere and the monthly Madrassee.*—I consider these cocoons very superior to the Madrassee; a maund of it would yield 50 per cent. more silk than from the Madrassee: they wound off nearly as well as the pure Cashmere cocoons sent by Mr. Cope. I think it would be of great utility if Captain Hutton would pursue the cross, but the only dread is the irregular hatching he will have to contend against. The silk from it I enclose; it is nothing like so good as I could wish, but the reasons and circumstances given by Captain Hutton, and the mode the cocoons were reared, fully account for it. I feel convinced that, with careful rearing, silk could be produced from it as good as in Bengal.

"*Oak Saturnia.*—I can merely say I have reeled some silk, and all from the inner cocoon, by steeping them in cow dung for days, and then reeling them: a sample of which I enclose. The thread is of 2 and 1 cocoon, is strong and mellow. If the difficulties could be overcome in winding them off, they might be of value to silk manufacturers. I failed in reeling them in warm water or in a solution of borax.

"*Saturnia Atlas.*—The moths had eaten out of the cocoons, it was therefore impossible to reel them. I should like you to send me some more cocoons of the two last, as I will endeavor reeling them in soda. I believe

I mentioned to you that I had succeeded in winding tusser cocoons this way.

"*Saturnia Canningi.*—I have been unsuccessful in winding them either in warm water, solution of borax, or with soda. I am steeping them in cow dung, and will let you know the result hereafter, as I cannot delay any longer replying to your letters, which should have had an earlier acknowledgment."

In a subsequent communication (19th October), Mr. Turnbull states, he has been unsuccessful in reeling the cocoons of *Saturnia Canningi.*

*Resolved.*—That a copy of the above report be forwarded to Captain Hutton.

No. 2. From Captain Thomas Hutton, Mussooree, dated 24th September, enclosing a small specimen of silk reeled from the oak-feeding *Saturnia*, and offering a few more remarks respecting it and other silk spinners:—

"Yours of the 15th instant reached me yesterday, and it is cheering after all the trouble and expense I have incurred to find that my labor is not thrown away. You must all bear in mind that the worms which produced the yellow cocoons lately sent down as the produce of the cross between the Cashmere and Nistry worms were *purposely* subjected to the very worst treatment, with a view to ascertain what they would undergo in this climate. They were reared in a room it is true, but the doors and windows were open day and night, so that every change of temperature was admitted freely, as well as the mist, which is literally a thick damp cloud, which wets everything as if it rained; the leaves and worms were consequently often dripping with wet by night and by day. Many of course died, but more survived and got through their troubles bravely, until they began to spin, when I removed them to a well-aired room with a temperature of 74°, and there the cocoons were formed. If then the silk does not reel freely, but comes away in masses, it is to be attributed to the treatment. Having, however, produced such fair cocoons in spite of bad management, I think we are entitled to expect favorable results next year from a judicious course of feeding. It is quite clear to me however that the silk-worm is not such a tender creature as it has been reported to be, and where it shows great delicacy of constitution, depend upon it there is disease at work. I can without the least trouble always keep up to this standard or a better one even by good feeding and properly regulated temperature. The eggs of this cross I would observe are diseased from the treatment the worm received, as you may see from the green eggs intermingled with healthy ones.

"Your annual (Boro Poolo) continues to hatch from the eggs of 21st and 22nd March, but, observe,—all the worms are from the healthy eggs, the

green ones and vinous-tinted ones have produced nothing as yet. The later the season the more worms, *i. e.* day by day a greater number come forth; for instance, on

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1st | September, there were | 2 | only. | 14th | September, there were | 2 | only. |
| 4th | ,, ,, | 1 | ,, | 15th | ,, ,, | 5 | ,, |
| 5th | ,, ,, | 1 | ,, | 16th | ,, ,, | 4 | ,, |
| 6th | ,, ,, | 2 | ,, | 17th | ,, ,, | 2 | ,, |
| 7th | ,, ,, | 2 | ,, | 18th | ,, ,, | 6 | ,, |
| 8th | ,, ,, | 2 | ,, | 19th | ,, ,, | 2 | ,, |
| 9th | ,, ,, | 2 | ,, | 20th | ,, ,, | 6 | ,, |
| 10th | ,, ,, | 2 | ,, | 21st | ,, ,, | 9 | ,, |
| 11th | ,, ,, | 4 | ,, | 22nd | ,, ,, | 12 | ,, |
| 13th | ,, ,, | 2 | ,, | 23rd | ,, ,, | 21 | ,, |

"All are thriving.

"Of the Moorshedabad few have hatched; they are sickly and change skin with difficulty, and some, if I did not assist them, would never throw off the two last segments.

| | | | |
|---|---|---|---|
| 1 | on | 21st | September. |
| 1 | ,, | 4th | ,, |
| 2 | ,, | 18th | ,, |
| 1 | ,, | 19th | ,, |
| 1 | ,, | 20th | ,, |
| 1 | ,, | 21st | ,, |

"Seven in all, of which two died.

"It is a curious fact that, while these hatch, the Cashmere worm still remains an annual, not one having come forth for an autumnal crop. You will receive a full entomological history of each species by-and-bye.

"With regard to the reeling of the cocoons already sent down, I doubt if they can be reeled without first removing the outer coat or shell; after removing that, the true cocoon inside will yield readily if boiled in a solution of borax; the tusser likewise yields to borax, but I found the Atlas intractable, and must try again. The Atlas is distinct from the Chinese species, and stands as *Saturnia Edwardsianus* of Adam White. If you remove the outer coating of the cocoons of the Eria, I suspect you would succeed in *reeling* the silk either in borax or something else. I will endeavor to send you some more Oak Saturnia cocoons, but I have not given mine fair play, as I had an idea that there was not silk enough to make the cultivation profitable, and from the neglect the worms died in the cocoons without spinning the proper quantity. As you think favorably of them, however, I will attend to the next batch and procure good cocoons. I enclose a little of the silk and the outer coat of a cocoon."

No. 3. From H. Cope, Esq., Umritsur, dated 3rd October, respecting silk culture in Rohilkund and the Punjab, of which the following is an extract :—

"I observe by the recent proceedings of your Society that a correspondent from Upper Rohilkund asks why that province should not produce silk. There is no reason why it should not, provided mulberry trees thrive there, and are to be found in sufficient numbers in any one or more spots to afford sufficient food for the cocoons. I observe that the same correspondent alludes to the alleged failure of the experiment at Lahore as attributable to the excessive dry heat. The experiment failed at Lahore because the worms had no food. (The dry hot climate of Bokhara produces excellent silk.) Mr. Wedderburn, a former Deputy Commissioner of Lahore, planted mulberry trees in all directions, especially on open uncultivated lands about Lahore, to remedy this very evil, and mulberry trees are now numerous; but when I asked a while ago whether I might purchase the leaves of these very trees, I was told in reply that my wishes would not be complied with! If any one in Rohilkund or elsewhere should be inclined to enter on an experiment during the ensuing season, pray state that I shall be most happy to furnish them with any reasonable quantity of silk-worm's eggs, free of charge, which they may require. I have every reason to believe that experiments will be made at Peshawur and at Kangra, where the zealous Deputy Commissioner, Mr. R. Saunders, is doing all in his power to elicit information and stimulate the people to exertion, and I shall proceed, as soon as the season is sufficiently advanced, to the planting of a plot of nearly *eight acres* of land, at this place with mulberry trees, which, I am happy to say, I have been enabled to purchase in fee-simple and on reasonable terms, a concession no doubt made to me in consideration of the use to which I intend to apply it."

No. 4. From W. H. Pringle, Esq., of Rajharra, giving some particulars respecting the mode of rearing the tussur worm in the Palamow district.

No. 5. From Captain Hutton, a communication, of which the following is an extract, in reply to certain observations of Mr. Cope, which were submitted at a previous meeting of the Society :—

"In the proceedings of the General Meeting of the Society for the month of August, I observe a communication from Mr. Cope, in which he endeavors to show that my experiments with silk-worms have failed through mismanagement. As Mr. Cope's statements are incorrect, I think it proper to offer a few remarks in contradiction of them.

"In the first place my experiment was not a failure as Mr. Cope complacently *assumes*, but a decided success, my cocoons being generally very satisfactory both as to quantity and quality of silk; and I can here and at Delhi

sell any amount of it at Rupees twenty-five (25) per seer, which is, I think, a tolerable criterion.

"The percentage of deaths in my experiment was not large, although amply sufficient to prove that disease was at work in the Cashmere stock, as it is in nearly all the domesticated Bombyces.

"Not one of the worms commented on was reared, as Mr. Cope asserts, *upon trees in the open air*, but all were located in a well-aired room in which the thermometer never rose above 74° nor fell below 72°. They were fed and attended to by myself alone, not only during the day, but up to between 10 and 11 o'clock at night, for as the *Bombycidæ* are all *night-feeders*, they require food to be given throughout the twenty-four hours, and not solely during the day time. The system of night-feeding having been nowhere practised, save occasionally in China, the worms have invariably been half-starved, and hence one reason why they have become diseased.

"The leaves given to my silk-worms were plucked from the black Chinese mulberry,—*not from shrubs or seedlings*, as Mr. Cope asserts, but *from trees* which, from my own knowledge, I can positively state to be fifteen years old, and probably more; and although it is no doubt true that some species of Bombyx will thrive better upon the white than upon the black mulberry, yet it is a pure absurdity to attribute the disease of the worm to the fact of its having been fed upon the sound and healthy leaves of the latter, especially since worms of the *Bombyx Huttoni* and of the Bengal *Madrassee* were similarly fed at the same time and in the same room *without showing symptoms of disease.*

"That I have advocated the method of rearing worms on the trees in the open air is true, but this was with the view of obtaining, if possible, a batch of eggs from worms fed in a natural way, supposing that they would thereby be rendered healthier. Such a method is stated by writers on the silk-worm to be practised in China, and in advocating such an experiment I likewise stated that *a suitable climate should be sought for*, as without that of course no such experiment could succeed.

"As to any statement of mine having been disproved by Mr. Bashford, the contrary is notoriously the fact, all Mr. Bashford's experiments having come to grief precisely as I and others of his correspondents foretold that they would do. The way in which those experiments were conducted, and the arguments by which Mr. Bashford endeavored to uphold them, clearly proved him and Mr. Henry Cope to be *no naturalists.*

"I have to thank Mr. Cope for his offer of more Cashmere seed, but as I have succeeded in obtaining a very good supply from the healthy portion of the stock formerly furnished by him, I shall have sufficient wherewith to carry

on my experiments upon a wider scale. It is somewhat ludicrous, however, to hear Mr. Cope talk of my coming round *to his views* in regard to the Cashmere and Italian worms being identical, since such has been my private opinion ever since I first became acquainted with the species at Candahar in 1840, although from the Bengal Annual *(Boro Poolo)* having been sent to me as the Italian stock, I was induced to pause ere I pronounced the Cashmere and Italian worms to be the same. My now stating that I expect to find them identical has led Mr. Cope to *adopt* the same view precisely as he *adopted* Mr. C. Blechynden's opinion that the paucity of silk in some of the cocoons sent down from the Punjab betokened a change of temperature at the time when the insect began to spin. Mr. Cope should have been aware that no worm can retain its silk when the proper time has arrived for forming the cocoon, and that if the spinning ceased from change of temperature, the insect would invariably die. The paucity of silk in some of his cocoons simply proved that the worm had not secreted the proper quantity, and that deficiency was caused by the weakness of diseased glands.

"That Mr. Cope was enabled, more by good luck than good management, to turn out some first-rate cocoons proves nothing more than I have proved myself, namely, that while many of the worms are seriously diseased, others on the contrary are perfectly healthy. It does not require the destruction of the entire stock to establish the fact of the presence of disease, any more than it requires the annihilation of the human race in order to prove that it too is far from sound. How Mr. Cope arrived at a knowledge of the way in which my experiments have been carried on is somewhat surprising, or at least would be so were it correct; but as it is he jumps to the conclusion that *all* my worms were fed *on shrubs in the open air*, simply because I sometime since informed him that I was trying an experiment on the trees, so far even was *that* experiment from failing, that I ascertained from repeated trials that worms thus fed grew twice as rapidly as those in the trays in the house, and that circumstance convinced me that *night-feeding* was absolutely necessary to bring the cocoon near to the natural size and fulness of silk. At the same time, however, I ascertained what in fact I had never doubted, namely, that ours is not the climate in which the insects will thrive in the open air, being both too boisterous and too changeable."

No. 6. From the Under-Secretary to Government of India, enclosing copy of a letter from Mr. F. Lotteri, "relative to an improved method of manufacturing the Moonga silk of Assam," together with samples of the raw silk which accompanied it, and requesting the opinion of the Society on them.

No. 7. From E. G. Buskin, Esq., of Messrs. W. Moran and Co., reporting on the above samples, and on some native reeled samples, which were also

submitted by Mr. Lotteri by way of comparison:—"*Native product.*—Very inferior in all respects, foul, uneven in size, and reeled in much too short a skein to be used in European manufactories; has been sold in London some time since at about 6*s.* per lb., and sent to France as an experiment, but did not answer, and was found quite unsuited for European consumption.

"As regards Mr. Lotteri's produce, it is no doubt a very great improvement on that of the natives, but it is very imperfect, being excessively uneven in size, and having scarcely any twist on the thread. I see no reason why this silk, with a little attention, should not be made suitable for the London market, provided it will take the dye; there was some difficulty in this respect, but I believe the French found means to overcome it, but this I am not sure about."

The Secretary intimated that, in forwarding copy of the above report to Government, he had also sent copy of a report of the Society's Silk Committee submitted in 1839 (*Transactions, Vol. VII, page* 194), on a specimen of raw silk prepared from the Moonga cocoon of Assam, by Messrs. Watkins and Mendes. The specimen in question, as also several others reeled from the Assam Moonga, and presented during the last twenty-five years, are in the Society's Museum.

*Cotton culture from foreign seed in the Sonthal Pergunnahs.*

The next paper submitted was from Mr. P. Burke, of Koosma, dated 24th September, regarding his trials with foreign seed in the Sonthal Pergunnahs.

*Communications on various subjects.*

The following letters were likewise submitted :—

1. From Colonel F. Jenkins, a few remarks regarding the growth of the Arabian date in India.

"I see there has lately been a discussion," writes Colonel Jenkins, "about our kujoors and dates, and how far it would be practicable to introduce the latter. I think my experience will enable me to settle the question. Both trees are perfectly identical, and the best dates turn out common "kujoors" in our soil and climate. Any one can satisfy himself of this. The stones of the dried dates in the bazar grow readily, and there are many trees here that have grown up from seed stones planted by me, and now bearing fruit for many years. If there be any difference, I should say those foreign plants grow more vigorously than the *dessee kujoor*, but the fruit is just the same. Many years ago there were some date palms growing at Cawnpore, the fruit of which I have eaten, and I think that a dry hot climate might have been

supposed more congenial to them. The fruit produced was little better than that of the common Bengal tree."

2. From Messrs. Binny and Co. of Madras, enclosing particulars from Messrs. Fischer and Co. of Salem, regarding the bales of cotton sent by them to compete for the prizes offered by the Society.

3. From Captain J. C. Haughton, Superintendent of Port Blair, applying for seeds of all sorts for the Andamans. (Complied with.)

4. From Major W. H. Hopkins, Commanding Darjeeling Depôt, applying for seeds for Soldiers' Garden. (Request anticipated.)

5. From Dr. D. Brandis, Superintendent of Forests, Pegu and Rangoon, applying for a quantity of foreign cotton seed, to be sent to him before May 1860. (Application registered.)

6. From Colonel C. J. Riddell, Lucknow, returning thanks for vegetable and flower seeds supplied for gardens attached to the batteries of the Royal Artillery in Oude.

7. From the Under-Secretary to Government of India, conveying the thanks of Government for cotton seed supplied to the Commissioner of Pegu.

8. From Mr. R. Scott, Botanic Garden, furnishing complete returns, in continuation of those submitted at the last Meeting, of trial sowings of North American and South African vegetable seeds: not a single seed has failed to germinate; the American have given a general average percentage of 45, and the Cape of 52.

---

*Wednesday, the 16th November* 1856.

W. G. Rose, Esq., Vice-President, in the Chair.

The proceedings of the last General Meeting were read and confirmed.

The following gentlemen, proposed at the last Meeting, were duly elected Members:—

Dr. John Sutherland; Messrs. N. Brice and W. J. Broncke; Drs. J. A. Guise, Neville Jackson, and T. J. Morris; Messrs. H. A. Porteous, Carl Schultz, R. Duncan, and Captain J. Bean.

The names of the following gentlemen were submitted as candidates for election:—

Lieutenant-Colonel John C. Guise, 90th Light Infantry,—proposed by Mr. James N. T. Wood, seconded by Mr. W. G. Rose.

Lieutenant L. W. Wilmer, 90th Light Infantry,—proposed by Mr. Wood, seconded by Mr. Rose.

John N. Bullen, Esq., Merchant, Calcutta,—proposed by Mr. James Cowell, seconded by Mr. Henry Crooke.

Lieutenant-Colonel E. W. Scott, Inspector General of Ordnance,—proposed by Captain John Eliot, seconded by the Secretary.

Patrick Smith, Esq., Cossimpore Factory, Furreedpore,—proposed by Mr. J. White Smith, seconded by Mr. James Ferlong.

The following contributions were announced :—

1. A quantity of seed of the "Sorgho Sucré" (*Sorghum saccharatum ?*) and a packet of pamphlets treating on the culture, &c., of the plant. Presented by the Board of Revenue.

Ordered—That this seed be distributed to all applicants, members and others.

2. Seeds of melon, cucumber, and water melon from Kashmere. Presented by H. Cope, Esq.

3. Seeds of the "iron wood tree," and of the "wild bread fruit tree." Presented by G. H. Thwaytes, Esq., Superintendent, Royal Botanic Garden, Kandy.

4. A few plants from Moulmein of *Amherstia nobilis*, doorians, and gangaus. Presented by George Buchanan, Esq.

The Gardener reports all these, with the exception of an *Amherstia*, to have arrived in good order.

5. Samples of eight best kinds of Penang woods. Presented by the Honorable W. T. Lewis.

Captain J. C. Haughton, who took charge of these woods from Penang to Port Blair, states, that the Chinese and Bengalee carpenters recognize four of the kinds ("Tambuso," "Tampany," "Matupose," and "Medaory Soorie") as common in the Andamans. Captain Haughton remarks—"The forest trees all grow to a magnificent size here [Port Blair]. I measured yesterday a fine wood oil tree—one thousand we have sacrificed—it was 117 feet to its lowest branch, with a minimum girth of nine feet, and sound throughout."

Mr. Lewis has obligingly promised to send in due course the blossom of the trees producing the above timber, with a view to their identification.

6. Samples of "Kangra hemp." Presented by H. Cope, Esq.

(Further particulars regarding this fibre will be found in the body of the proceedings.)

7. Sample of cotton raised from foreign seed at Kishnaghur. Presented by the Revd. F. Schurr.

The following is extract of Mr. Schurr's note on the subject :—

"I send you a little cotton, grown in my compound from the seeds which Mr Douglas sent several years ago. My Christians have been cultivating some, but their instruments are unfit for cleaning it, so they do not know what use

to make of it; and they say, too, that the fibre is too coarse for their spinning wheels, therefore they have given up the cultivation of it. Perhaps some member of the Agricultural Society knows of a process to render the cultivation of this kind of cotton profitable. If the raw produce, without cleaning, could be sold in Calcutta, I believe the ryots would begin the cultivation, as the trees yield a great quantity, and live four or five years."

A recommendation was submitted from the Council to divert the amount (Rs. 50 per mensem), originally proposed to be granted for the salary of an Assistant Gardener, to increasing the present number of coolies from 20 to 30, and for adding to the pay of some of the *mallees* of the establishment. Agreed to.

*Sale of Punjab-grown Flax in the English market.*

A communication on the above subject was submitted by the Government of the Punjab. (Published in this Number.)

*The Hemp of Kote Kangra, identical with that of Europe.*

The next papers read were a series of letters from Mr. Cope respecting the "Kote Kangra hemp," accompanied with specimens :—

To THE SECRETARY, AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

"SIR,—In a letter recently addressed to the local press by Mr. J. H Thornton, C. S., Personal Assistant to the Financial Commissioner of the Punjab, on the subject of flax, the following paragraph occurs :—

"Along with the flax some specimens of Himalayan hemp (which is found to be a species of Rhea fibre, apparently the same as the *Urtica nivea* or China grass of commerce) were also forwarded. Regarding these the Secretary to the Dundee Chamber of Commerce states, in a communication recently received, that the fibre, if properly prepared, will suit most admirably for cordage, and could be made to compete with the best St. Petersburgh hemp which at present fetches about £30 per ton.

"I strongly suspect there is some mistake in Mr. Thornton's assertion that the sample alluded to, and sent to Dundee, was the produce of an URTICA at all. I have, on the contrary, reason to believe that it is nothing more nor less than the same 'Kangra hemp' sent home years ago by Mr. McLeod, and reported on so favorably by Dr. Royle. (See his *Fibrous Plants*, where he says :—'It is the fibre which is mentioned as not breaking with a weight of 400lbs., when China grass from Assam broke with 320lbs., and St. Petersburgh hemp with only 160lbs. It has, moreover, appeared to all the practical men who have since then examined it as the strongest fibre with which they are acquainted,'—*page* 331.) Dr. Royle was, I believe, himself mis-

taken in thinking that this fibre was obtained from the CANNABIS *sativa*, misled by that fruitful source of error the word 'hemp.' The CANNABIS grows abundantly in the hills as every one knows, but the people have not yet learnt to apply its excellent fibre to use. My impression is that both the Kangra hemp of Mr. McLeod and the supposed fibre of the URTICA *nivea*, alluded to by Mr. Thornton, are nothing more nor less than the Sunn of the plains (CROTALARIA *juncea)* produced on the hills, and especially in Kooloo, to a small amount, comparatively speaking, under the most favorable circumstances. Being rotted in fresh running water, it assumes a much better appearance than the produce of the plains, generally rotted in stagnant, dirty village pools. I may be mistaken in my opinion, and have taken steps to make myself sure.

"To enable you to test the strength of this magnificent fibre, and compare it with the numerous specimens in your Museum (the microscope would be of material use in this comparison), I have the pleasure to send you about half a seer from a quantity sent me by Mr. Reginald Saunders, C. S., Deputy Commissioner of Kangra, who is exerting himself in every way to develop the resources of his favored district. The subject of Indian fibres is still, comparatively speaking, in its infancy, notwithstanding all Dr. Royle's labors, and it would be very desirable to collect into one grand experimental farm every fibre-yielding plant that has been brought into use, with the view of making comparisons in every possible respect of soil, cultivation, cost, value, and strength. The Dhoon of Dheyra offers the fittest localities for such an experiment.

"HENRY COPE.

"*Umritsur, 7th October* 1859."

"SIR,—Since I did myself the pleasure to write to you regarding the so-called Kangra hemp, Mr. Thornton has been so good as to favor me with an outline of *his* reasons for believing it to be the produce of a nettle, which are founded on a report recently received from certain merchants in England, who subjected the specimens to close examination, and on the opinion of Messrs. Noble and Co. of London, who submitted the specimens to microscopic examination, and are convinced that the fibre is that of the Rhea.

"I have myself been examining the Kangra fibre and comparing it with the Sunn under a powerful microscope, and though there is undoubtedly a difference, it does not seem to be so great as should exist between a CROTALARIA and BŒHMERIA, genera so distinct from each other in almost every respect. I have used my utmost endeavors to obtain only a leaf of the plant

from which this fibre is obtained, as that will be enough to settle the generic question; and in the meantime send you a further specimen passed over the finest heckle in my possession, from which you will perceive that it assumes a very different and much more valuable character than in the state of my first specimen, and that its strength is peculiarly developed in its finer fibres. Whatever genus the plant, from which this fibre is obtained, may belong to, there is no doubt that it is of considerable value and deserving the utmost attention of your Society, for the reason that it no doubt exists in other parts of the Himalayas, and that the plan, if a nettle, adopted for stripping the fibre may be usefully adopted in treating the Assam Rhea. I shall forward you further information as soon as obtained, and remain, &c.

" HENRY COPE.

" *Umritsur*, 12*th October* 1859."

" SIR,—I have the honor, in continuation of my letters regarding the hill fibre that has attracted attention at home, and been supposed there to be the produce of an URTICA or BŒHMERIA, but which I thought, for reasons assigned, was, in all probability, obtained from the Sunn plant (CROTALARIA *juncea*), to inform you that I have, since I last addressed you, received from Mr. Reginald Saunders, Deputy Commissioner of Kangra, ten magnificent specimens of the plant yielding this fibre, flower, and fruit. Some measure 10 feet in length, with 8 feet of stem clear of leaves, most of them 9½ and only one 8½ feet. The thickest is 2 and a quarter inches in circumference, the thinnest 1 inch and a half. The fibre is already with you, and it only remains for me to state that it is the produce of the common hemp plant of Europe, or CANNABIS *sativa*.

" It is singular that the question has never been solved by a simple recourse to the plan I have pursued, *viz*. that of examining the plant from which this fine fibre is obtained; and I am happy in the opportunity Mr. Saunders has so obligingly afforded me of solving the mystery with which it seemed enveloped.

" I deem it right to state here that you expressed to me sometime ago your belief, entertained ever since Mr. D. F. McLeod first brought this fibre to notice, that it was identical with the Russian hemp, the produce in fact of CANNABIS *sativa*. I am happy to confirm your well-grounded opinion.

" The fact is very interesting, and should afford encouragement to all who may be inclined to grow HEMP in the hills. It is known to abound everywhere in the Himalayas, but it has hitherto been considered, like the flax of the plains, unfit for use on account of its branching character. Here is a most satisfactory proof not only that it grows in the manner especially required for fibre, but that the fibre it yields is of the most valuable kind.

I have not yet been favored with the London reports on which it is set down as the produce of a nettle, but as soon as I receive it, hope, by permission, to communicate its contents to your Society.

"HENRY COPE.

"*Umritsur, 3rd November.*"

Mr. John Stalkartt, to whom these specimens had been submitted for examination, after offering a few remarks, read the following report on them :—

"This fibre appears to be of the same nature as the Russian hemp, but it is not so strong. This may arise from various causes;—*firstly*, not having been cultivated with proper manure, and not sown in a proper manner, not close enough together; and, *secondly*, from not having been properly prepared. The accompanying sample which I have heckled will show how it can be improved with a little care and attention. I believe that all Russian hemp is more or less heckled. Russian hemp has a peculiar property, which is not possessed by the present known Indian fibres, such as the "sunn," the "Bombay hemp," "Jubbulpore hemp," and "Cochin hemp," that of imbibing tar and amalgamating more particularly with a larger quantity of tar, so as to enable it to resist readily the effects of extreme heat and extreme cold."

Since the meeting was held, specimens of the plant in question have been received from Mr. Cope, and immediately recognized by Dr. Thomson as the true hemp, CANNABIS *sativa*.

*Communications on various subjects.*

The following letters were also submitted :—

1. From Under-Secretary, Government of India, enclosing a summary of correspondence submitted by the Government of Bombay, respecting the question of the irrigation of cotton crops.

2. From the Honorable W. T. Lewis, Resident Councillor, Penang, a letter to his address from Mr. George Windsor Earl, in reply to certain enquiries of the Society :—

"The timber best adapted for Railway sleepers or piles for bridges that ever I saw or heard of is the *Eucalyptus*, a gum-tree of the North-coast of Australia, where the forests consist almost exclusively of this kind of timber. The best varieties are the stringy-bark, the black-butt, and the iron-bark, which, if left in the log (that is, without being cut up into planks), are almost indestructible except by fire, as they are not attacked by the *Teredo navalis*, nor by the white-ant, and do not rot either under ground or under water. The only precaution required is to fell these trees while in full vigor, as the

gum which forms their sap is universally considered to be the preserving element. My experiences at Port Essington, where both the white-ant and the sea-worm abound, enable me to vouch for this fact.

"If very large quantities are required, I think it would be worth while to send there for supplies, as ships, especially such as would answer for carrying timber, could be hired at very cheap rates. I should like to know the exact dimensions of the logs required, and the prices that would be given at Calcutta, as there are many ships lying idle here which might be profitably employed in this work if the owners were only put in the way of going about it. Timber of the girth required is so abundant, especially near the sea, that in any of the harbours of the North-coast of Australia, from Port Essington to the Gulf of Carpentaria, a ship of 500 tons could obtain a full cargo within a radius of a quarter of a mile from the nearest landing place.

"I have said something on this subject in *The Indian Archipelago Journal, Vol. VI. p.* 257-8, if you have it at hand. I did not however think of Railway sleepers at the time."

3. From the Revd. T. C. Ferminger, enclosing a letter to his address from Dr. Alexander Hunter, Superintendent of the Industrial School of Arts, Madras, in which an application is made for a log of Himalayan Box wood, and a promise to try its applicability for engineering purposes, and to report thereon.

Agreed that two logs be sent to Dr. Hunter.

4. From John E. Amory, Esq., United States, Vice-Consul General, enclosing several circulars, and requesting information on the various topics embraced for the United States Government.

*Resolved*—That a complete set of the *Transactions* of the Society be sent to Mr. Amory, and that he be requested to reciprocate.

5. From H. Cope, Esq., submitting a report on the Neilgherry Munjeet, forwarded by Dr. Cleghorn, and referred to in the September proceedings.

Ordered—That a copy of the above report be sent to Dr. Cleghorn.

6. From Captain J. C. Haughton, Superintendent, Port Blair, returning thanks for the large supply of seeds recently forwarded to him.

7. From Baboo Hurrymohun Mookerjee, conveying his acknowledgments for the donation of Rs. 50 for the first part of his *Krishi Durpun.*

# UNIVERSAL LIFE ASSURANCE SOCIETY,

ESTABLISHED IN LONDON AND CALCUTTA, 1834,

*Confirmed by Special Act of Parliament.*

**Invested Capital Pounds Sterling Six Hundred and Seventy Thousand, of which One-half is Held by the Indian Branch.**

---

## Indian Branch.

DIRECTORS, CALCUTTA:

| | |
|---|---|
| William H. Smoult, Esq. | George Brown, Esq. |
| John N. Bullen, Esq. | Alexander Walker, Esq. |

James Welch, Esq.

---

LOCAL DIRECTOR AT ALLAHABAD:

Cecil Stephenson, Esq.

| PHYSICIAN. | AGENTS AND SECRETARIES. |
|---|---|
| Allan Webb, Esq., M. D. | Messrs. Braddon & Co. |

---

| MADRAS AGENTS. | BOMBAY AGENTS. |
|---|---|
| Messrs. Bainbridge, Bayard, Gair & Co. | Messrs Leckie & Co. |

---

The marked success which has for upwards of twenty years attended the operations of this Society, justifies the Directors in calling the attention of the public to the *following peculiar advantages* held out to all classes desirous of effecting Assurances on Lives

1*st*. The Insured in the Society have a most satisfactory guarantee for the settlement of claims in the *large Capital of the Institution*, not merely subscribed, but actually invested, *exceeding* £670,000, of which One-half is held by the Indian Branch, being an amount greatly in excess of the

Capital of any similar Society in India, and their rates have recently been arefully investigated by two eminent Actuaries in London (*viz.* Messrs. Peter ardy and Charles Jellicoe), and are declared to be as moderate as is deemed onsistent with perfect security to the Assured.

2*nd*. *One-fifth* of the ascertained profits of the *five preceding years* is vided *annually* between the Policy-holders and Shareholders—three-fourths the former, and one-fourth to the latter. The remaining four-fifths are set rt to enter into the average of the succeeding years, and *thus to provide inst unforeseen contingencies.*

is most satisfactory to the Directors to state, that, *notwithstanding the u al losses occasioned by the Mutinies in India,* the amount of profits d red on the last annual division, *viz.* in May, 1859, was *equivalent to a re tion of thirty-six per cent. on the original annual premium.*

. The Tables of Premium have been framed with the greatest care, and tho applicable to Indian lives have been deduced from actual, and reliable exp ence, obtained from the records of the India House.

4 Proposals are received for Assurances for the whole term of life, either on t participating, or on a non-participating scale at a lower rate of premiun Also for short periods varying from one to seven years on the most modc e terms.

5*th* The following is an extract of the Rates of Premium for an Assurance of Co pany's Rupees One Thousand. –

## CIVIL.

| Age. | One Year. | | Three Years. | | Five Years. | | Seven Years | |
|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. |
| | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. |
| 20 | 11 0 | 5 8 | 11 0 | 5 8 | 11 8 | 5 12 | 12 0 | 6 0 |
| 30 | 13 8 | 6 12 | 14 0 | 7 0 | 14 0 | 7 0 | 14 8 | 7 4 |
| 40 | 16 0 | 8 0 | 16 0 | 8 0 | 16 0 | 8 0 | 16 8 | 8 4 |
| 50 | 19 0 | 9 8 | 20 0 | 10 0 | 20 0 | 10 0 | 21 8 | 10 12 |

## MILITARY.

| Age. | One Year. | | Three Years. | | Five Years. | | Seven Years. | |
|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. |
| | Rs. As | Rs. As | Rs. As | Rs. As. | Rs. As | Rs. As. | Rs. As. | Rs. As. |
| 20 | 13 0 | 6 8 | 13 8 | 6 12 | 14 0 | 7 0 | 14 0 | 7 0 |
| 30 | 16 0 | 8 0 | 16 0 | 8 0 | 16 8 | 8 4 | 17 0 | 8 8 |
| 40 | 19 8 | 9 12 | 20 0 | 10 0 | 20 0 | 10 0 | 20 0 | 10 0 |
| 50 | 22 8 | 11 4 | 23 0 | 11 8 | 23 8 | 11 12 | 24 0 | 12 0 |

Intermediate Ages in Proportion.

**The following is an extract of WHOLE LIFE rates:**

## CIVIL.

| Age. | With Profits. | | | | Without Profits. | | | |
|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | | Quarterly. | | Half-yearly. | | Quarterly. | |
| | Rs. | As. | Rs. | As. | Rs. | As. | Rs. | As. |
| 20 | 21 | 0 | 10 | 8 | 16 | 0 | 8 | 0 |
| 30 | 24 | 0 | 12 | 0 | 19 | 8 | 9 | 12 |
| 40 | 29 | 8 | 14 | 12 | 24 | 8 | 12 | 4 |
| 50 | 37 | 0 | 18 | 8 | 31 | 0 | 15 | 8 |

# MILITARY OR NAVAL.

| | With I fits. | | | | Without Profits. | | | | Annual English Rates. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Age. | Half-yearly. | | Quarterly. | | Half-yearly. | | Quarterly. | | | | |
| | Rs. | As. | Rs. | As. | Rs. | As. | Rs. | As. | £. | s. | d. |
| 20 | 23 | 8 | 11 | 12 | 18 | 0 | 9 | 0 | 1 | 18 | 8 |
| 30 | 27 | 0 | 13 | 8 | 22 | 8 | 11 | 4 | 2 | 8 | 10 |
| 40 | 31 | 8 | 15 | 12 | 26 | 8 | 13 | 4 | 3 | 3 | 0 |
| 50 | 38 | 8 | 19 | 4 | 32 | 0 | 16 | 0 | 4 | 5 | 6 |

6th On return of an Insurer to Europe, either for *a temporary or permanent residence,* and *without reference to the state of health on return,* subject however to notice being given at the London Office the Premium is reduced to the English rate, corresponding with the *age when the Assurance was originally effected;* and in the case of participating Policies, the profits are allowed on the *English rate of Premium,* whereby Indian Assurers can continue their Policies in England on *most favorable terms.*

*7th.* Military Officers holding Civil appointments are allowed to subscribe at the Civil rate of premium, on notice being given to the Agents of the Society.

8*th.* Premiums are payable either annually, half-yearly or quarterly, and, on certain conditions *monthly* and a grace of 28 days is allowed for such payments.

*9th.* Policies for the whole term of life, which have been in force for five years, will be purchased by the Society, or loans granted thereon to the extent of two-thirds of their estimated value.

10*th.* Policies can be effected in this Office *free of charge,* and Medical Referees are remunerated by the Society by a fee of Ten Rupees for each report on lives proposed for Assurance with this Institution.

Tables of Rates, Forms and Instructions for effecting Assurances, can be obtained on application to the Secretaries, or to

| | |
|---|---|
| Messrs. WALTER SMYTH and Co., .. ... .. | *Dinapore.* |
| Messrs. HAMILTON, BROWN and Co., .. .. | *Mirzapore.* |
| Messrs. GREENWAY BROTHERS, .. .. .. | *Cawnpore.* |
| F. W PLACE, ESQ., .. .. .. .. .. | *Agra.* |
| J. M. HAMILTON, ESQ, .. .. ... .. | *Allahabad.* |
| J. A GIBBONS, ESQ., .. .. .. ... | *Meerut.* |
| Messrs. MACKINNON, HALL and Co., .. .. | *Ghazeepore.* |
| H. DEAR, ESQ., .. .. .. .. .. | *Monghyr.* |
| A. CHRISTIAN, ESQ., .. .. .. .. .. | *Tirhoot.* |
| MANAGER LAHORE CHRONICLE PRESS, .. .. | *Lahore.* |
| H. SPENCER, ESQ, .. .. .. .. .. | *Mooltan.* |
| Messrs. SYME and Co, .. .. .. .. | *Singapore.* |
| S. N. GREENE, ESQ., .. .. .. .. .. | *Penang.* |
| Messrs. WALKER, BORRADAILE and Co., .. .. | *Hong Kong.* |

BRADDON AND CO.
*Agents and Secretaries.*

CALCUTTA, No. 14, STRAND,
*January,* 1860.

# Indian Rates of the Universal Life Assurance Society.

TABLE No. 1.—CIVIL.

Annual Premium required for the Assurance of 1,000 Rs. for periods from One to Seven Years, on the Lives of Persons in the H. C. Civil Service and others not exposed to the hazards of Military and Maritime occupations *without participation* in the Profits of the Society.

| Age. | One year. | Two years. | Three years. | Four years. | Five years. | Six years. | Seven years. | Age. |
|---|---|---|---|---|---|---|---|---|
| 18 | 21 | 21 | 22 | 22 | 23 | 23 | 23 | 18 |
| 19 | 22 | 22 | 22 | 22 | 23 | 23 | 24 | 19 |
| 20 | 22 | 22 | 22 | 23 | 23 | 24 | 24 | 20 |
| 21 | 22 | 22 | 23 | 23 | 24 | 24 | 24 | 21 |
| 22 | 23 | 23 | 24 | 24 | 24 | 24 | 24 | 22 |
| 23 | 23 | 24 | 24 | 24 | 24 | 24 | 25 | 23 |
| 24 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 24 |
| 25 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 25 |
| 26 | 24 | 24 | 25 | 25 | 26 | 26 | 27 | 26 |
| 27 | 25 | 25 | 26 | 26 | 27 | 27 | 28 | 27 |
| 28 | 26 | 26 | 27 | 27 | 28 | 28 | 28 | 28 |
| 29 | 27 | 27 | 28 | 28 | 28 | 28 | 28 | 29 |
| 30 | 27 | 27 | 28 | 28 | 28 | 28 | 29 | 30 |
| 31 | 28 | 28 | 28 | 28 | 29 | 29 | 29 | 31 |
| 32 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 32 |
| 33 | 28 | 28 | 29 | 29 | 30 | 30 | 30 | 33 |
| 34 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 34 |
| 35 | 30 | 30 | 30 | 30 | 31 | 31 | 31 | 35 |
| 36 | 30 | 30 | 30 | 31 | 31 | 32 | 32 | 36 |
| 37 | 31 | 31 | 31 | 31 | 32 | 32 | 32 | 37 |
| 38 | 31 | 31 | 32 | 32 | 32 | 32 | 32 | 38 |
| 39 | 31 | 32 | 32 | 32 | 32 | 32 | 32 | 39 |
| 40 | 32 | 32 | 32 | 32 | 32 | 32 | 33 | 40 |
| 41 | 32 | 32 | 32 | 32 | 33 | 33 | 34 | 41 |
| 42 | 32 | 32 | 32 | 33 | 34 | 34 | 35 | 42 |
| 43 | 33 | 33 | 34 | 34 | 35 | 35 | 36 | 43 |
| 44 | 34 | 34 | 35 | 35 | 35 | 36 | 36 | 44 |
| 45 | 34 | 35 | 35 | 36 | 36 | 37 | 38 | 45 |
| 46 | 35 | 35 | 36 | 36 | 36 | 37 | 39 | 46 |
| 47 | 36 | 36 | 36 | 37 | 38 | 39 | 40 | 47 |
| 48 | 36 | 36 | 37 | 38 | 39 | 40 | 40 | 48 |
| 49 | 37 | 38 | 39 | 39 | 40 | 40 | 42 | 49 |
| 50 | 38 | 39 | 40 | 40 | 40 | 41 | 43 | 50 |
| 51 | 40 | 40 | 40 | 41 | 42 | 43 | 44 | 51 |
| 52 | 40 | 41 | 42 | 43 | 44 | 44 | 45 | 52 |
| 53 | 42 | 43 | 44 | 44 | 44 | 46 | 47 | 53 |
| 54 | 43 | 44 | 44 | 45 | 46 | 47 | 48 | 54 |
| 55 | 44 | 45 | 45 | 47 | 48 | 48 | 48 | 55 |
| 56 | 45 | 46 | 47 | 48 | 48 | 49 | 50 | 56 |
| 57 | 46 | 48 | 48 | 49 | 50 | 51 | 52 | 57 |
| 58 | 48 | 48 | 50 | 51 | 52 | 52 | 54 | 58 |
| 59 | 49 | 50 | 51 | 52 | 54 | 56 | 56 | 59 |
| 60 | 51 | 52 | 52 | 54 | 56 | 58 | 60 | 60 |
| 61 | 52 | 53 | 55 | 56 | 59 | 61 | 64 | 61 |
| 62 | 55 | 56 | 57 | 60 | 62 | 66 | 70 | 62 |
| 63 | 58 | 60 | 61 | 64 | 66 | 71 | 76 | 63 |
| 64 | 62 | 64 | 66 | 68 | 71 | 77 | 84 | 64 |
| 65 | 67 | 69 | 72 | 75 | 77 | 84 | 91 | 65 |

*** *Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Table No 1. Example —A person aged 30, may by paying 27 Rs. secure 1,000 Rs. to his representatives, if his death should occur within *one* year; if within *five* years, by paying 28 Rs. annually, and if within *seven* years, by paying 29 Rs. per annum.

## Indian Rates of the Universal Life Assurance Society.

### TABLE No. 2.—MILITARY AND NAVAL.

Annual Premiums required for the Assurance of 1,000 Rs. for periods from One to Seven years, on the Lives of Persons exposed to the hazards of Military and Maritime occupations, ***without participation*** in the Profits of the Society.

| Age. | One year. | Two years. | Three years. | Four years. | Five years. | Six years. | Seven years. | Age. |
|---|---|---|---|---|---|---|---|---|
| 18 | 25 | 25 | 25 | 26 | 26 | 27 | 27 | 18 |
| 19 | 26 | 26 | 26 | 27 | 27 | 28 | 28 | 19 |
| 20 | 26 | 27 | 27 | 28 | 28 | 28 | 28 | 20 |
| 21 | 27 | 28 | 28 | 28 | 28 | 28 | 28 | 21 |
| 22 | 28 | 28 | 28 | 28 | 28 | 29 | 29 | 22 |
| 23 | 28 | 28 | 28 | 29 | 29 | 30 | 30 | 23 |
| 24 | 28 | 28 | 28 | 29 | 29 | 30 | 30 | 24 |
| 25 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 25 |
| 26 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 26 |
| 27 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 27 |
| 28 | 30 | 31 | 31 | 32 | 32 | 32 | 32 | 28 |
| 29 | 31 | 32 | 32 | 32 | 32 | 33 | 33 | 29 |
| 30 | 32 | 32 | 32 | 32 | 33 | 34 | 34 | 30 |
| 31 | 32 | 32 | 33 | 33 | 34 | 35 | 35 | 31 |
| 32 | 32 | 33 | 34 | 34 | 34 | 36 | 36 | 32 |
| 33 | 33 | 34 | 35 | 35 | 36 | 36 | 36 | 33 |
| 34 | 34 | 35 | 36 | 36 | 36 | 36 | 37 | 34 |
| 35 | 35 | 36 | 36 | 36 | 37 | 37 | 38 | 35 |
| 36 | 36 | 36 | 36 | 37 | 37 | 38 | 38 | 36 |
| 37 | 36 | 37 | 37 | 38 | 38 | 39 | 39 | 37 |
| 38 | 37 | 38 | 38 | 38 | 39 | 39 | 40 | 38 |
| 39 | 38 | 39 | 39 | 39 | 40 | 40 | 40 | 39 |
| 40 | 39 | 39 | 40 | 40 | 40 | 40 | 40 | 40 |
| 41 | 40 | 40 | 40 | 40 | 40 | 41 | 41 | 41 |
| 42 | 40 | 40 | 40 | 41 | 41 | 42 | 42 | 42 |
| 43 | 40 | 40 | 41 | 41 | 42 | 42 | 43 | 43 |
| 44 | 41 | 41 | 41 | 42 | 43 | 43 | 44 | 44 |
| 45 | 42 | 42 | 42 | 43 | 43 | 44 | 44 | 45 |
| 46 | 43 | 43 | 43 | 44 | 44 | 44 | 44 | 46 |
| 47 | 43 | 44 | 44 | 44 | 44 | 45 | 45 | 47 |
| 48 | 44 | 44 | 44 | 45 | 45 | 46 | 46 | 48 |
| 49 | 44 | 45 | 45 | 46 | 46 | 47 | 48 | 49 |
| 50 | 45 | 46 | 46 | 47 | 47 | 48 | 48 | 50 |
| 51 | 46 | 47 | 47 | 48 | 48 | 48 | 49 | 51 |
| 52 | 47 | 48 | 48 | 48 | 49 | 50 | 50 | 52 |
| 53 | 48 | 48 | 49 | 49 | 50 | 51 | 52 | 53 |
| 54 | 49 | 49 | 50 | 51 | 52 | 52 | 52 | 54 |
| 55 | 50 | 51 | 51 | 52 | 52 | 53 | 53 | 55 |
| 56 | 51 | 52 | 52 | 53 | 53 | 54 | 55 | 56 |
| 57 | 52 | 53 | 53 | 54 | 55 | 56 | 56 | 57 |
| 58 | 53 | 54 | 55 | 56 | 56 | 57 | 58 | 58 |
| 59 | 54 | 55 | 56 | 57 | 58 | 60 | 60 | 59 |
| 60 | 56 | 56 | 57 | 59 | 60 | 62 | 64 | 60 |
| 61 | 57 | 58 | 59 | 60 | 63 | 65 | 68 | 61 |
| 62 | 60 | 60 | 61 | 64 | 66 | 69 | 73 | 62 |
| 63 | 62 | 64 | 65 | 68 | 69 | 75 | 80 | 63 |
| 64 | 66 | 68 | 70 | 72 | 74 | 80 | 87 | 64 |
| 65 | 71 | 73 | 76 | 78 | 80 | 87 | 94 | 65 |

****** Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.***

**Table No. 2, Example.**—A person aged 30, may, by paying 32 Rs. secure 1,000 Rs. to his representatives, if his death should occur within *one* year; if within *five* years by paying 33 Rs. annually, and if within *seven* years by paying 34 Rs. per annum.

# UNIVERSAL LIFE ASSURANCE SOCIETY.

## WHOLE LIFE.

| Age. | CIVIL. | | MILITARY AND NAVAL. | | ENGLISH RATES. | | Age |
|---|---|---|---|---|---|---|---|
| | TABLE No. 3. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe. | TABLE No. 5. Annual Premiums required for the Assurance of 1,000 Rs. *without participation in profits, but with reduction of Premium on return to Europe.* | TABLE No. 4. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe. | TABLE No. 6. Annual Premiums required for the Assurance of 1,000 Rs. *without participation in profits, but with reduction of Premium on return to Europe.* | Annual Premium for assuring £100, for the whole of life, with participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 3 and 4. | Annual Premium for assuring £100, for the whole of life, without participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 5 and 6. | |
| 18 | 41 | 31 | 45 | 34 | 1 17 2 | 1 13 6 | 18 |
| 19 | 42 | 32 | 46 | 35 | 1 17 11 | 1 14 2 | 19 |
| 20 | 42 | 32 | 47 | 36 | 1 18 8 | 1 14 10 | 20 |
| 21 | 43 | 33 | 48 | 37 | 1 19 6 | 1 15 7 | 21 |
| 22 | 43 | 34 | 49 | 38 | 2 0 5 | 1 16 5 | 22 |
| 23 | 44 | 35 | 49 | 39 | 2 1 4 | 1 17 3 | 23 |
| 24 | 44 | 36 | 50 | 40 | 2 2 3 | 1 18 1 | 24 |
| 25 | 45 | 36 | 51 | 41 | 2 3 3 | 1 19 0 | 25 |
| 26 | 46 | 37 | 51 | 42 | 2 4 4 | 1 19 11 | 26 |
| 27 | 46 | 38 | 52 | 43 | 2 5 5 | 2 0 11 | 27 |
| 28 | 47 | 38 | 53 | 44 | 2 6 7 | 2 2 0 | 28 |
| 29 | 48 | 39 | 54 | 45 | 2 7 8 | 2 2 11 | 29 |
| 30 | 48 | 39 | 54 | 45 | 2 8 10 | 2 4 0 | 30 |
| 31 | 49 | 40 | 55 | 46 | 2 9 11 | 2 5 0 | 31 |
| 32 | 50 | 41 | 56 | 46 | 2 11 0 | 2 5 11 | 32 |
| 33 | 51 | 42 | 57 | 47 | 2 12 3 | 2 7 1 | 33 |
| 34 | 52 | 43 | 58 | 47 | 2 13 7 | 2 8 3 | 34 |
| 35 | 53 | 43 | 58 | 47 | 2 14 11 | 2 9 6 | 35 |
| 36 | 54 | 45 | 59 | 49 | 2 16 5 | 2 10 10 | 36 |
| 37 | 55 | 46 | 60 | 50 | 2 18 0 | 2 12 3 | 37 |
| 38 | 56 | 47 | 61 | 51 | 2 19 7 | 2 13 8 | 38 |
| 39 | 58 | 48 | 62 | 52 | 3 1 3 | 2 15 2 | 39 |
| 40 | 59 | 49 | 63 | 53 | 3 3 0 | 2 16 9 | 40 |
| 41 | 60 | 51 | 64 | 54 | 3 4 9 | 2 18 4 | 41 |
| 42 | 62 | 52 | 65 | 55 | 3 6 6 | 2 19 11 | 42 |
| 43 | 63 | 53 | 66 | 56 | 3 8 3 | 3 1 6 | 43 |
| 44 | 65 | 54 | 68 | 57 | 3 10 2 | 3 3 2 | 44 |
| 45 | 66 | 55 | 69 | 58 | 3 12 2 | 3 5 0 | 45 |
| 46 | 67 | 57 | 70 | 60 | 3 14 5 | 3 7 0 | 46 |
| 47 | 69 | 58 | 72 | 61 | 3 16 9 | 3 9 1 | 47 |
| 48 | 70 | 60 | 73 | 62 | 3 19 4 | 3 11 5 | 48 |
| 49 | 72 | 61 | 75 | 63 | 4 2 3 | 3 14 1 | 49 |
| 50 | 74 | 62 | 77 | 64 | 4 5 6 | 3 17 0 | 50 |
| 51 | 76 | 65 | 79 | 67 | 4 9 1 | 4 0 3 | 51 |
| 52 | 79 | 68 | 81 | 70 | 4 12 10 | 4 3 7 | 52 |
| 53 | 81 | 71 | 83 | 73 | 4 16 11 | 4 7 3 | 53 |
| 54 | 84 | 74 | 86 | 76 | 5 1 2 | 4 11 1 | 54 |
| 55 | 87 | 76 | 89 | 78 | 5 5 10 | 4 15 3 | 55 |
| 56 | 89 | 79 | 91 | 81 | 5 10 10 | 4 19 9 | 56 |
| 57 | 92 | 81 | 94 | 83 | 5 16 2 | 5 4 7 | 57 |
| 58 | 96 | 84 | 98 | 86 | 6 1 10 | 5 9 8 | 58 |
| 59 | 99 | 86 | 101 | 88 | 6 7 7 | 5 14 10 | 59 |
| 60 | 103 | 88 | 105 | 90 | 6 13 2 | 5 19 11 | 60 |
| 61 | 108 | 94 | 110 | 96 | 6 18 0 | 6 4 3 | 61 |
| 62 | 113 | 99 | 115 | 101 | 7 4 1 | 6 9 9 | 62 |
| 63 | 118 | 104 | 120 | 106 | 7 9 11 | 6 15 0 | 63 |
| 64 | 124 | 109 | 126 | 111 | 7 16 7 | 7 1 0 | 64 |
| 65 | 131 | 114 | 133 | 116 | 8 3 7 | 7 7 3 | 65 |

*** *Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Parties assured in Company's Rupees in India, who may determine on paying their future premiums in England, will be required to pay them at the fixed rate of Exchange of Two Shillings per Company's Rupee; and in the event of such assurance becoming a claim payable in England, the sum assured will be paid at the same fixed rate of Exchange of Two Shillings per Company's Rupee.

# THE JOURNAL

OF THE

# Agricultural & Horticultural Society

OF

# INDIA.


--

*On the cultivation of Silk at Mussooree, Himalaya Mountains; with notes on the treatment of the Silkworm: By Capt.* THOMAS HUTTON, F. G. S., *Superintendent of Government Silk Plantations.*

THE Settlement of Mussooree in the Western Himalaya, situated in North latitude 30°. 27′, 33″, and East longitude 78°. 6′. 20″, may be said to command elevations varying from 2,000 to nearly 8,000 feet above the sea level.

Bounded on the West and North by the River Jumna, just before it debouches from the mountains: on the North-east by the stream of the Aglaar and Tyne range; on the East by the military depôt of Landour, aud on the South by the broad valley of the Deyrah-Doon, which, stretching along the base of the mountains from the Ganges on the East to the Jumna on the West, is walled in to the southward by the Siwalik range, which divides it from the southern plains. The locality may be said to possess a climate which, if we may be permitted to draw conclusions from its Fauna, may be truly characterised as semi-Chinese; or perhaps, more correctly speaking, as closely approximating to that of the more northerly and silk-yielding provinces of the Celestial Empire.

[illegible]t, whole superficial area is broken by a constant [illegible]teep mountain ridges, and deep intervening [illegible]perature and organic productions of different [illegible]t naturally exhibit considerable variation, [illegible]cording to the elevation and proximity to the hot plains of India; thus at Deyrah,* the capital of the valley of that name, situated in North latitude 30°. 19'. 57", and East longitude 78°. 6'. 2", with an elevation of 2,310 feet, the average temperature in May is given as 91°. 5', of Fahrenheit, while that of Landour, which enjoys a higher elevation by more than 5,000 feet, is, for the same month, estimated at only 67½ degrees. At Jer-i-panee, on the road up to Mussooree, at an elevation of 5,200 feet, the temperature in summer may be reckoned at about 6° higher than on the Castle Hill in the Landour Bazaar; while between Mussooree at an average elevation of 6,500 feet, and the station of Deyrah at 2,310 feet, there is a difference of nearly 20 degrees of Fahrenheit.

Thus, after traversing the Siwalik range, and entering the Doon from the southern plains, we first arrive, on the ascent to Mussooree and Landour, at the small town and Military Station of Deyrah, the elevation of which, as above stated, is 2,310 feet above the sea, and situated in North latitude 30°. 19'. 57" and East longitude 78°. 6'. 2".

From Deyrah we ascend in a North-easterly direction, and in a distance of about six miles, to Rajpore, a bazaar at the immediate foot of the mountains, in North latitude 30°. 23'. 57" and East longitude 78°. 8'. 25", with an elevation of about 3,000 feet.

Thence to Jer-i-panee (literally "*the root of the water*", or spring) we ascend to 5,200 feet in North latitude 30°. 25'. 19", and East longitude 78°. 7'. 39".; and, lastly, we arrive at Mussooree with an average elevation of

* The latitude and longitude are determined at the stations of the G. T. S., and are furnished by a friend in that department.

6,500 feet, in North latitude 30°. 27'. 33", and East longitude 78°. 6'. 20".

To the Eastward of Mussooree, on the same range, (the one being the Civil, and the other the Military Station,) rises Landour, having, at the highest point, an elevation of about 7,600 feet, and beyond it, still further to the East, is the peak called Secunder Devi, rising to 9,196 feet.

On the North-east, divided from Mussooree by the deep broad valley of the Aglaar river, rises the Tyne range, whose highest point is about 10,024 feet. On the West, overlooking the river Jumna, are other peaks rising from 7,000 to 7,500 feet, and, as a general rule, all these heights are divided from each other by deep trough-like valleys and glens, which completely sever the one from the other, and in which, not only is vegetation extremely dense and luxuriant, but the temperature rises very high.

With such diversity of elevation and temperature it is but natural and reasonable to expect a corresponding diversity in the natural productions of the district; and accordingly, we find an intermixture, not only of Indian and Chinese, but likewise of European forms.

In the insect world, more especially, the Entomologist will recognise not only the swallow-tail and painted Lady butterflies, together with the common cabbage butterfly of Europe,* but he will, likewise of Chinese forms, meet with both *Erebus Macrops,* and *Crepuscularis*, *Nymphalis Jacintha, Junonia Ænone, Almana,* and *Orithya,, Liconenitis leucothoe,* and a host of other Lepidoptera; among the hard winged beetles he will find the beautiful *Buprestis bicolor, Copris Midas, molossus,* and *Bucephalus;* while if China can boast of its Atlas moth, its silk-yielding *Bombyces,* its Tussur and Eria moths, and its oak-feeding *Saturnia (Antheræa Pernyi.)* Mussooree can likewise produce their analogies in its own Atlas *(Attacus Edwardsi,)* its *Bombyx*

* *Papilio Machaon ; Junonia Cardui,* and *Pontia Brassica.*

*Huttoni*, its *Tussur, Eria,* and oak-feeding *Saturnia (Antheræa Roylei.)*

The fact that so many forms are common to both Mussooree and to China, and that the tea-plant of the latter country thrives well both in the hills and in the Doon, would lead at once, even in the absence of indigenous silk-spinning, to the conclusion that silk also might be extensively cultivated at suitable elevations along the slopes of the lower ranges of the outer Himalaya, where the temperature, like that of the best tea growing districts of China, may be about 73° of Fahrenheit; but when we find not only a true mulberry feeding *Bombyx*, a *Tusser*, an *Eria*, an *Atlas*, and four or five other wild species all occurring in different portions of the same district, we are surely not expecting too much when we venture to express a belief that with proper care bestowed upon the insects, Mussooree will, at no distant date, prove to be one of the most productive and best silk yielding districts in India.

Experiments already tried with the domesticated Chinese *Bombyx mori* of Cashmere, and with the Madrassee *vel* Nistry *(B. Cræsi. nob.)* of Bengal, have proved beyond a doubt, not only that the worms thrive well in this climate, that there is also a ready and remunerating market for their silk; while, strange to say, the Bengal *annual* silkworm, with white silk, *(B. textor nob.)* known there as the *boro-poloo* of the natives, yields at Mussooree a *second* crop also, a fact which can be attributed to nothing but the climate.

Another circumstance, calculated to add weight to the opinion that Mussooree will prove to be a good silk yielding district, is to be found in its temperate climate; for, notwithstanding all that prejudice, ignorance, theory, and self-interest have hitherto asserted in regard to a high temperature being necessary for the production of that article, it is nevertheless a well established fact, that in a hot climate the domesticated worms become feeble, degenerate, and languish,

and the silk is in consequence deteriorated in quality and reduced in quantity.

The superiority of silk grown in Northern climates has been established by experiment long since instituted in Northern Europe, where, notwithstanding Count Dandolo's erroneous idea, that the silkworm is indigenous to the Southern Provinces of China, and therefore requires a high temperature to bring it to perfection, it was found that the silk produced in Sweden was far superior to the best Italian produce, and the same was, likewise, the case in Bavaria; nay, we need scarcely travel so far from our own doors, in order to prove that temperate regions are more favorable to the worm than tropical ones, since we have the fact prominently displayed in the superiority of the Cashmere stock over that of Bengal, the silk of the former being recently valued in Calcutta at twenty-four rupees per seer, while that of the Madrassee worm reared in Bengal, is reported at only fourteen rupees, thus showing a difference of ten rupees per seer in favour of the up-country produce.

Next to that of Cashmere, therefore, (if indeed ours be not superior) the climate of the lower ranges of the Himalaya lying between the Sutlej and the Ganges, will probably become the most productive, provided always that proper care and attention are bestowed upon the management of the insects; for even the much belauded Punjab, although, in my opinion, infinitely better than Bengal for silkworm cultivation, is yet far too hot to preserve it long in perfect health,* and with a better system of cultivation than that which is practised in Cashmere, or indeed than any native cultivators are likely to bestow, the probabilities are greatly in favour of our Hill districts eventually being made to "bear the bell" in India, and even to rival the far-famed Italian produce.

* Captain Hollings long since attributed his failure in the Punjab to the heat of the climate.

The cultivation of the silkworm dates from a very early period, being carried back by some Chinese records to 2,700 years before the birth of Christ, or about 500 years after the Deluge, and, consequently, 4,500 years ago.

China, the native country of the domesticated species, was naturally that in which silk was first turned to account, and it is said that the Empress Si-ling-chi was the first person "who observed the labours of the silkworms on wild mulberry trees, and applied their silk to use."

For many centuries after this, however, silk was only known in Europe as a natural curiosity, its real origin being totally unsuspected. The Greeks obtained a knowledge of it for the first time when Alexander the Great conquered Persia about 330 years before Christ, and from them it passed to the Romans. Still this was only *raw-silk*, and the insect which produced it was entirely confined to China, under the strictest penalties, until the time of the Emperor Justinian, when, as related in a previous paper,* the eggs were conveyed to Constantinople by two Nestorian monks.

With regard to the treatment of the worms in more modern times, theory appears to have done its best to render them weak and sickly, by asserting that a high temperature was necessary for the successful rearing of the insects: whereas the truth is that a temperate climate is by far the most suitable to it. A native of the Northern provinces of China, it is but reasonable to suppose that the heat of such countries as India, Persia, and Syria would act injuriously upon its constitution, and render great precautions necessary in its management; and under any circumstances a temperate climate has, as M. Boitard justly observes, a great advantage over hot countries, in the fact that it is easy to raise the temperature of the rearing houses by artificial means; whereas it is always difficult, and sometimes even impossible, to lower it. Besides which,

* Vide *Journal Agri-Hort. Soc. of India*, Vol. XI, page 12.

experience has fully proved, both in India and in Italy, that a moderate and equal temperature is the best, since in the former country it is admitted that the winter and spring crop is the most successful, while in the latter a mild spring invariably produces better results than when the temperature is higher, and indeed it not infrequently happens that in a hot spring the crop has nearly altogether failed; hence it is not the heat, but the Northern or geographical position of Italy which has rendered its silk so famous.

Self-interest, to say nothing of ignorance of the requirements of the insect, will doubtless point to the satisfactory results obtained in France, in Sicily, Italy, Piedmont, Spain, and even in India, and all will be attributed to the warmth of their several climates; but the question is, do these results claim precedence over what has been effected in colder climates, or are we to forget that Italy, France, and Spain are considerably to the Northward, and may possibly be indebted for their success to that very circumstance? If we can rely upon the published statements the results hitherto obtained in elevated temperatures are far inferior to those obtained in Northern latitudes. The best silk of China is produced in the Northern Provinces of the Empire, and in India the finest species of *Bombyx* under cultivation is that of Cashmere; while in Europe, we are informed that "some years back silk was grown in Prussia of a quality which was considered superior to that even of Italy; a fact that gives strength to an observation contained in a paragraph in the *Stockholme Journall* for March, 1824, and reprinted in the *Bulletin Universel* of April, 1825." After detailing the introduction of several plants lately raised in Sweden, it adds: "That similar motives have instigated the encouragement of the growth of silk in this country; the idea, indeed, is not new, and experiments made long ago presented encouraging results. Experiments made

in 1823 in Stockholm for the purpose of discovering some indigenous tree, capable of nourishing the silkworm, have procured silk of very fine quality. The culture of the mulberry tree, is extending itself in the provinces, and important communications on the most convenient mode of rearing the worm have been generally promulgated. The silk so produced in Sweden has confirmed in the amplest manner, the remark formerly made *on the superior fineness and solidity of silk grown in the North, compared with that from more temperate climes;* a fact that has received the unanimous sanction of the members of the Royal Society of Commerce, as well as of many silk manufacturers. It supports the ordinary preparation and dye equally with the best Indian silk, possessing the same brilliancy and the same softness. The silk also that has been grown for the last few years in Bavaria *is superior to that produced in Italy.*"*

It has even been stated that "this branch of commerce has been established in Russia for several years in a latitude as far north as 54°, and with such success as to warrant the establishment of manufactories for working the silk, in the hope that a few years would render that country independent of Persia for the supply of this valuable produce;" and indeed no longer ago than the 20th of August, 1859, it was stated in the pages of the *Illustrated London News,* that "an attempt is about to be made on a scale of some importance, to introduce the growth of silk into Holstein as a staple article of commerce. The mulberry trees which have been planted for some time on the shores of the Baltic near Heilegenhafen have thriven well, and an abundant supply of cocoons has been received, to the future produce of which those who are engaged in the enterprise look forward with confidence for a profitable result."

* Preface to translation of Count Dandolo, by the British, Irish and Colonial Association.

Yet after all, where is the difficulty in rearing the worms in Northern latitudes, provided the trees themselves will grow there? In his report on the Paris Universal Exhibition, Dr. Royle has informed us, that silkworms were "early introduced into India from China, where it flourishes chiefly about Nankin, *or in 32° of North Latitude;* but in India none of the old silk filatures extend to beyond 26° of North latitude," and this he very justly attributes "to the excessive heat and dryness of the North-West Provinces of India," which are unsuitable to the constitution of the worm.

Nankin, therefore, where silk flourishes abundantly, is nearly two degrees further North than Mussooree, or about the latitude of Upper Kunawur, a district to the North of Simla, where the worm, being beyond the influence of the wet monsoon, would no doubt be cultivated with great success. Here we have likewise another proof that it is not a hot climate which is required, and Bengal was evidently not selected on account of its being in reality a good silk district, but merely because, the Hills not being then in our possession, it was considered less inimical to the constitution of the worm than the dry scorching winds of the North-West Provinces.

But if we can succeed, through the exercise of a little common sense and skill, in rearing exotic plants, why can we not in like manner, rear the insects which feed upon them? All that is necessary are properly constructed houses, in which the required degree of warmth and shelter can be produced; so that, provided the trees would grow, the insect might be cultivated in almost every part of Europe.

In regard to the mulberry itself, trees grown in stiff wheat lands are sure to produce leaves that are totally unsuited to the production of good silk, the necessary ingredients, or components from which silk gum is secreted, being either wholly wanting, or present in very small quantities; and yet so little is generally known upon these

subjects among silk cultivators, that the failure of experiments made in England with such leaves, was attributed to *an excess,* instead of to *a deficiency* of nourishing properties, the truth being that the leaf abounds in water, while the saccharine and resinous matters are nearly altogether wanting.

Nearly the same results will be insured by rearing trees in too rich a soil; if fine fruit be the object, such treatment may be well enough; but for the production of healthy and nutritious leaves the system is fully as bad as the former, inasmuch as the tree is forced, artificial, and incapable of yielding leaves possessed of the requisite qualities.

It is true that the mulberry tree will grow, and as to external appearances, thrive well in almost any soil; but that which is the best adapted for enabling the tree to produce the particular kind of leaf that furnishes the best silk, is what may be termed a good *Tea-soil,* composed of certain proportions intimately blended, of *silica, clay,* and *carbonate of lime,* with a little vegetable matter, the silica and lime predominating over the other constituents. In a very hot climate like that of the Deyrah-Doon, or the plains of India, such a soil will require occasional irrigation in the summer months, as otherwise its light and porous nature would cause it to separate from the roots which run chiefly near the surface, horizontally, and so insure the destruction of the tree; but in a climate not subject to such high temperature, the trees, after the two first years, may be safely left to nature.

In a country which, like India, is subject to long continued periodical rains, the nutritive particles in a light and porous soil would soon be carried down beyond the reach of the roots, so that a top dressing of suitable materials will be occasionally required to renew the soil, and the same rule will apply when surface irrigation is resorted to.

In a mountainous district like Mussooree, which is occasionally subject to strong winds, it would be as well to have here and there on the borders of the plantation, a few large forest trees capable of resisting a gale, and affording shelter to the tender wood of the mulberry trees, which without such precaution would be constantly liable to injury in the loss of branches, and there are few trees less able to bear such mutilation, or even injudicious pruning, than the mulberry; for the same reason I should recommend that no plantation be formed at a greater elevation than five thousand feet, in order to avoid the weight of snow in winter, which often splits off every branch. At the same time great care must be taken that the mulberry plants are not placed too much under the shade of the protecting trees, and on no account ought they to be so near as to admit of the rain drops from the one falling upon the other; all that is required is so to arrange that the indigenous forest trees may be so situated with regard to the plantation as to break the force of the gales which may sweep over it.

Let no one, however, run away with the idea that a plantation is easily formed, and that there are no difficulties to contend with, for although it has been stated that no insect save the silkworm *(B. mori.)* will feed upon the mulberry leaf, or attack the tree, any one who may attempt to form a plantation in the mountain tracts of India, will soon be convinced to the contrary, and find that the theories of the closet naturalist are not always to be received as gospel truths; the name of the pests which destroy the trees, is, in fact, *legion.*

At Mussooree, not only are many young plants and cuttings destroyed by grubs gnawing away the roots, but much and very serious damage is occasioned during the night by the barking-deer (*Cervulus moschatus,* DeBlain,) and another closely allied species (*C. apicalis. nob.*) which not only eat off the leaves and tender shoots within their

reach, but, in order to obtain the succulent foliage at the summit, cut though the stems of young trees which have attained to the height of six and eight feet, thus prematurely dwarfing, and converting them into mere bushes, often to the number of twenty or thirty in a single night; besides which, unless well watched, cattle, goats, and sheep, will eagerly devour them during the day.

Of caterpillars which are apt to destroy the foliage there are at least three species, and so destructive is one of these to the wild mulberry, that a large tree is sometimes half denuded in the course of a few days from the numbers of these pests, which usually appear in the latter end of summer, while another, which is a *Geometra*, attacks the young buds early in the spring.

Besides these, there is likewise a species of *Lamia*, which, if the young trees are not narrowly examined, will cause much damage, its larva being nourished within the trunk, and rendering the tree weak and sickly, while the mature beetle gnaws the green bark from the tender branches.

On visiting a nursery plot one morning in the beginning of September, I found to my great annoyance that five fine young trees of about seven feet in height and with stems the thickness of a man's little finger, had, during the night, been cut off at about three feet from the summit. As no barking-deer could have reached so high, or made such a clean cut, I was, at first sight, inclined to regard it as the work of some mischievous person, but, on closely examining the summit of the stump, I discovered in every instance, just below the top, a small longitudinal incision, and intumescence at the side, and I was then at once convinced that a beetle had caused the damage, and, after a short search, a female *Lamia* was discovered gnawing the bark of another young tree.

Cutting off the tops of the stumps just below the puncture, and laying bare the swollen part, I discovered a long

groove in the wood, in which, as in a coffin, was snugly deposited a good sized egg of about two-eighths of an inch in length.

But why, it may be asked, did the female, after depositing her ova cut off the summit of the stem? Instinct evidently taught her to act in this manner for the preservation of the grub, which in due time would be disclosed from the egg, for the upper portion of the young stem being green and succulent, and deficient in the proper nutritive juices and woody fibre, besides being very liable to be nipped off by the frosts of winter, would insure the destruction of the grub if it took the upward direction. In order effectually to prevent this, and compel the larva to descend into the thicker and more woody parts of the tree, the female beetle saws off the green summit at about three to four feet from the top, and thus, by cutting off all upward progress, clearly indicates the direction in which her offspring is to proceed; and that this decollation of the young shoot is made for the express purpose of preventing the grub from taking an upward course seems further proved by the fact that the head of the egg, that part from which the grub would issue, is invariably placed pointing downwards, as if for the express purpose of indicating the direction in which its welfare behoves it to travel; besides which, were the upward direction the proper one, the egg would be inserted head upwards, and at the bottom, or base of the stem, as is the case with the *Lucanidæ*,* or stag-beetles, with a long line of nourishment before it. By the present wise arrangement, however, not only is the young grub prevented fron taking a wrong direction, but, as its size and voracity increase and its bulb expands, it meets as it descends, with a correspondingly increasing supply of proper nourishment, with ample space in the additional thickness of the stem.

* The larvæ of the stag-beetles remain generally in the root and thickest part of the trunk of oaks, &c.

Having, in spite of all drawbacks, at length succeeded in forming a plantation, or rather in having produced the young trees, great care should be bestowed, in removing them from the nurseries to the open grounds, in order to preserve the roots from injury; for this purpose I should recommend that cuttings planted in February, and well watered until the setting in of the monsoon, be at that season removed from the nursery, as the roots, being short, would be less liable to injury, and indeed with ordinary care should meet with none; whereas if left until the following spring, the roots will have attained to so large a size, and have become so thoroughly interlaced as to render it impossible to remove the tree, without denuding them of earth, and breaking away the larger ones, an injury that will materially retard the growth and affect the future healthiness of the tree. Standard trees should certainly not be planted closer than from 16 to 20 feet apart, while if intended to be allowed to grow to a large size, even 36 feet apart will not be found too much. This last is, indeed, the distance adopted in some parts of France.

In the feeding of the worms great attention will be required, no leaves gathered from shrubs and immature trees should on any account be administered, and no tree under four or five years can be considered as sufficiently mature.

Standard trees are preferable to all others, and if these are grown in a suitable soil, such as I have above pointed out, the leaves will, as a general rule, be found to possess all those qualities which will enable the worm, by preserving it in health, to secrete good silk in proper quantity; and it may be said that the older is the tree, within certain limits, the better will become the leaf. Trees grown in dry soil generally produce the best leaf, and where, as in the hot climate of the Deyrah-Doon, much irrigation is required, the leaf, no matter whether of the mulberry or tea-plant, will possess far more water than it ought to do.

The theory, laid down by Count Dandolo, which restricts the supply of leaves to four times during the day, and giving none at night, is a pure absurdity, and calculated only to insure the starvation of the worm; neither is the Chinese method of repeatedly feeding the young worms, and decreasing the quantity as they grow older, to be attended to. Nature is the best and only guide that the cultivator should imitate, and as she has always ready at hand a fresh and abundant supply whenever the worm is inclined to feed, so ought the leaves to be supplied at short intervals, both during the day and during the night, renewing them, in fact, whenever the previous supply has become withered and unfit for use. To lessen the quantity and frequency of supply as the worm increases in size and voracity, is so obviously opposed to common sense, that no one, I imagine, who is not incurably wedded to a theory would be tempted to follow such a system, and even if the worm should consume all the leaves, the waste should not be grudged, since it will certainly be more than compensated for by the superior health of the insect, and consequent increase in the quantity and quality of the silk produced; surely, far better is it to waste a few leaves, then by practising too niggard an economy, secure the semi-starvation of the worm, and insure a deficiency of silk; besides which a little practice will soon teach the feeders so to regulate the quantity to the number of worms, as that there shall no waste ensue.

To the necessity of supplying the worms with food throughout the night, as well as by day, I would, as a Naturalist, earnestly call the attention of the cultivator, for not only are all the *Bombycidæ* true night-feeders, but I have proved by repeated experiments that worms thus treated grow twice as rapidly as those which are fed by day only, and although it may be said that such a method will materially increase the trouble and expense of rearing, yet such trouble will be fully compensated by the increased

vigour and well being of the insect, as well as by the rapidity with which it will necessarily undergo its allotted changes; not, however, as now, by being artificially forced onwards by extreme heat, but by a more natural and healthy system of feeding. Besides which, if good silk is required, no trouble or expense ought to be grumbled at, so long as the desired end is attained, and the easiest, aud in fact, the only way to ensure good silk is to insure, likewise, the general health and welfare of the insect which is to produce it; and consequently, it is but a false economy to pursue an injudicious system merely for the sake of avoiding a little additional labour and outlay, which necessarily produce more lucrative returns.

It is to be observed, however, that, by night-feeding, I do not mean merely to advocate the system pursued in the Deccan by Signor Mutti, of "*gathering leaves in the afternoon for use during the night,*" since such a system I should regard as a patent method of slow poisoning, no matter in what climate, or country pursued; but in a temperature ranging from 85° to 92°, such as the Signor acknowledges to have prevailed in his rearing-houses, the juices of the leaves reserved for night use, if not entirely parched up by the heat, must either be more or less, in a state of fermentation before they reach the worms, or the fibre of the leaf will have become hard, dry, and unwholesome.

By night-feeding, I mean that leaves must be gathered fresh, and during the night, and given to the worms in that condition at stated and proper intervals. The same system must, likewise, be pursued by day, since it is utterly impossible to keep leaves properly and naturally fresh for any time after they are gathered from the trees; and yet Signor Mutti advises that "the leaves, except in the hot season, should not be given during the day, immediately after being gathered, *but kept for a few hours*!" He does not explain why he thinks this necessary, nor indeed does it appear

possible to assign a valid reason for acting in a manner so thoroughly opposed to nature and to common sense, for how do the wild worms manage in this respect? They feed upon the leaf in all its native freshness, no matter whether heated by the sun, or moistened by the rains and dews of heaven! It is, in my opinion, this very system of withholding the leaf until incipient fermentation has set in, that has in a great measure tended to induce the present state of unhealthiness to which the worms of every country where such artificial systems are maintained, have been reduced.

It appears, moreover, by underrating the strength of the insect's constitution, to be quite possible to fall into the error of over-pampering it, and inducing debility; such error, indeed, has undoubtedly been committed, and from the idea which most people entertain of the great susceptibility and sensitiveness of the worm, it has hitherto been too much the fashion to bake the insects in rooms which are almost hermetically sealed against every breath of fresh air; true, they have lived, or rather languished, through the ordeal, and have produced what has been considered a valuable crop of silk; but the question is, would they not have been in a better condition as to health, and have produced a far better crop under more judicious treatment?

That they do not require to be thus sealed up has been proved by some experiments lately instituted in France, and which I shall presently notice, as well as by others tried by myself at Mussooree in 1859, with a view to ascertain what degree of exposure they would actually bear. The worms selected were obtained from a cross between the Cashmere stock (*Bombyx mori*) and the Nistry, or Madrassee of Bengal (*B. Crœsi nob.*); they were under the cover of a roof, it is true, neither the direct rays of the sun, nor rain, could fall upon them, but with this exception they were as much exposed as if they had been in the open air. The experiment was tried in the very height of the wet monsoon,

and as every door and window, eight in number, were purposely left open on all sides, the dense damp mists in which the hills are at that season enveloped floated freely over the worms by day and by night, often rendering the trays, the leaves, and the insects themselves as wet as if they had been exposed to a shower of rain. Many of course, died, but this might have happened to the same extent, even under better treatment; the majority, however, struggled through every disadvantage, and at length spun golden yellow cocoons resembling those of the Madrassee, but exceeding them in size, and containing one half more silk, giving great satisfaction to experienced judges in Calcutta, to whose inspection they were submitted, and this notwithstanding the trying treatment they had undergone, beating the best Bengal *Bombyx*.

All this time the thermometer was ranging up and down *ad libitum* between 62° and 78°, the changes being often sudden, from bright sunshine to dense damp mist. Finding that, notwithstanding the frequent saturation of the trays aud leaves, the worms still lived on, I was induced to try further experiments by feeding other worms upon wet leaves, for the purpose of testing the truth of the prevalent theory, that "wet leaves invariably cause sickness and death." The theory is true only to a certain extent, and under particular circumstances; for instance, were the leaves kept for some hours, as Signor Mutti recommends, and in that state given wet to the worms, the effect would, no doubt be deadly, from the simple fact that the gases exhaled or thrown off by the process of fermentation are partially taken up by the moisture on the surface of the leaves, and form acids which destroy the worm; but, on the other hand, so long as the leaf is fresh and free from the putrefaction process, the moisture on its surface is perfectly innocuous, precisely as is the case with the wet leaves growing on the trees which are eaten by the wild worms with perfect impunity.

The range of temperature allowed by Mons. Boitard in his work "On the cultivation of the mulberry tree and silkworm," is from 66° to 70° Fahrenheit, and beyond that, or from 86° to 95° Fah.; he says, the worm will produce little silk, and even that of a coarse quality. The reason for this he finds in the fact that by a high temperature the worm is so rapidly forced to a false or *premature* maturity, that the secreting organs have not time themselves to come to perfection; and these views are sufficiently borne out by actual experience, since nearly all competent observers have remarked that the longer time the worm occupies in coming to maturity, the better will be the cocoon, Mr. Speed, among others, remarking in the third volume of the "Transactions of the Agri-Horticultural Society of India," when speaking of the *Desee worm, (B. fortunatus. nob.)* that, according to the length of time, "is the quality of the cocoon, the longest period producing the best"; and the longest period in this instance is, moreover, found to be that which is occupied by the November *bund* or crop; thus showing that the less the worm is *forced,* and the cooler becomes the season, the more healthy and vigorous is the worm, and consequently, the better also is the silk; while again, in regard to temperature, Signor Mutti has remarked in the 6th volume of the same Transactions, that, "during the heat of the day, I keep all the doors and windows shut, and open the whole of them as soon as the heat declines. By these means I am able to keep the temperature at from 85° to 92° degrees. This very extraordinary year (1837,) on account of the heat, cold and rain, I have been unable to equalize the temperature so much. For some days the thermometer in the rooms rose to 98°, *and this was attended with a loss of about* 15 *per cent. of the worms. The survivors made but small cocoons.*"

Here, then, we have a practical proof of the truth of M. Boitard's remarks, and we see at once that the high temperature to which the worms are subject in the Deccan, and

other parts of the plains of India, must tend rapidly to render them of less value than those which are cultivated in more temperate climates. Even the temperature of the Deyrah-Doon, 91° 5′ in May, and of the Punjab, must far exceed the limit beyond which the worm ceases to be healthy. In the Deccan we perceive that the ordinary temperature of 85° to 92° is far in excess of that which the French cultivators assign as the limit.

We have likewise a farther practical proof of the advantage of a well aired room over one that is necessarily kept shut up at a high temperature, in the fact that, "Madame Pirodon at Versond, near Grenoble, has recently informed the French Academy of Sciences, that she has caused silkworms to be reared from the egg in rooms with windows open, but supplied with curtains to prevent currents of air from coming on the worms, *and also in warm rooms with closed windows.* The worms reared in the former *produced the best silk of the year.* The silk of the worms in the latter *was nearly unsaleable!*"*

It becomes, then, quite obvious that the worms thrive better, and, as a natural consequence, produce a more valuable silk in a temperate, than in a hot tropical climate, and hence the almost certainty of arriving at more satisfactory results at Mussooree and similar elevations in the lower Himalaya, than in the Punjab and plains of India; for besides all the facts above adduced, it was long since pointed out in the pages of "The Transactions of the Agricultural Society of India," that, "the climate best adapted for the cultivation of the worm, is the borders of a mountainous, or high country, where the air is warm yet temperate and regular. Thus the best cultivated in Europe, is in Piedmont, the Milanese, and the Tyrol, which countries border on the Alps: and indeed the silk produced in all parts of the north of Italy, which are mountainous, is good; for there the sky is

* *Comptes Rendus*, as quoted by *Illustrated London News*, August 13, 1859.

clear, and the air warm, yet temperate and pure. The worm cultivated in the valleys where the warmth is great, exudes a looser and more irregular fibre, and the thread formed from it becomes rather harsh and sticky."*

This appears to me to be precisely what might have been expected when we reflect, the worms are from the mountainous tracts of the northern parts of China, and there is still more hope for Mussooree as a silk-producing district, to be found in the fact that there is little difference in point of latitude between it and Tche-kiang in China, the province in which silk was first cultivated, Mussooree being situated in north latitude 30° 27′ 33,′ and the province of Tche-kiang in from 29° to about 30° 20′ of north latitude, the district being described as comprehending "the south-eastern corner of the plain, and the northern portion of the mountainous country extending along the sea. It produces more green tea than any other Province, and also silk, rice, grain, and pulse in abundance. Its principal port is Ning-po."†

Although, as M. Boitard observes, the worms thrive well in a temperature of from 66° to 70°, yet I am inclined to regard such range as too confined, since I have found that they thrive healthily, and as well as one could possibly wish, in a temperature ranging from 62° to 78°, but beyond 80° Fah. I confess I should look for nothing but debility and sickness.

As all climates out of China, and certainly the entire system now dignified with the name of *cultivation*, must be, to a great extent, purely artificial, I should recommend in the treatment of the silkworm, the adoption of the same principles as those by which we are guided in the rearing and cultivation of exotic plants, that is to say, that they should be reared in well constructed houses, in which a suitable

* Report of Messrs Dover and Norton, Vol 2, Agri. Trans. p. 152

† Art: China, p 79. *Penny Cyclopædia.*

temperature could always be maintained, and fed upon the freshest and most nutritious leaves.

Having formed a plantation of standard trees, no matter whether the fruit be black, or white,* the speculator should then erect suitable rearing houses for the worm, either within the plantation, or as near to it as possible, so that the leaves when gathered would have but a short distance to travel, and these should be gathered fresh and fresh at certain intervals, and be at once given to the worms; if they do not require them, the leaves will be wasted,—what then? Experience and attention will soon teach the feeder the exact length of time which must elapse before the worm will feed again, and enable him to regulate the supply accordingly. If the worms are in good health, and in a temperate climate they will be ready to feed again by the time the second supply can be gathered and brought in. But I again repeat that a little waste of leaves at the outset is not to be considered as a loss, if in the end a better crop of silk can be obtained.

It will be observed however that I am here speaking of a case in which the plantation is the property of the cultivator and reeler, and I maintain that such a plan, wherever followed, will always be found in the end to be the cheapest and the most productive, because the worms having been well fed and attended to under his own immediate supervision, will produce a better return than can reasonably be expected where one party finds it advantageous to sell damaged and immature leaves to another who cares not for their quality so long as they are cheap, and whose object is merely to turn out the largest possible number of cocoons without caring for their quality. On the other hand, where every thing is under the eye and management of a competent Superintendent,

* Every tyro advocates the use of the white mulberry tree, yet every plantation produces both black and white, and no one could distinguish between skeins of silk produced from both, if once intermixed!!

not only are the worms carefully attended to, but none but the healthiest leaves are given to them, and the natural consequence is a better supply of cocoons. Under the present system in Bengal, the worms are never properly attended to, and the reeler at the filature must take what he can get, and "be thankful for sma' mercies."

The rearing-house should be so constructed as freely to admit the light on all sides, and be furnished with glazed doors and windows; stoves, or fire-places, are likewise necessary for the purpose of raising the temperature when required, and of evaporating all damps from whatever cause arising.

In fine calm weather the windows during the heat of the day should, provided that the cultivation be carried on in a temperate climate, be left partially open, for the purpose of ventilating the room, and giving the insects the benefit of the pure fresh air; but on any change, or threatened change of weather from without, the windows should be immediately closed and equable temperature be preserved.

In the hot plains of India, the rooms must, of course, be kept closed during the heat of the day, and thus the worms must to a great extent suffer, clearly showing that such climates are quite unadapted to the permanent health and welfare of the insect; while reared in native huts amidst darkness, malaria, smoke, and dirt, what wonder that the worm degenerates and dies?

Cleanliness, a thing unknown to the natives in the proper sense of the word, is of the utmost importance, as the effluvium arising from an accumulation of the excrement, and remains of leaves, to say nothing of the abominable and overpowering odour from a few dead worms, is sure to generate malaria, and so kills or weakens the insects. On this account all wastage, refuse, &c., should be carefully removed daily, and of such consequence to the health of the silkworm do I consider this operation, that I am surprised to find so experienced a cultivator as Signor Mutti advocating the

cleansing of the feeding trays only *once in four days,* and that, too, in the hot climate of the Deccan, where, with a temperature of 92°, putrefaction and fermentation must be much more rapid and fatal than in a temperate climate. Nature, moreover, speaks an unmistakable language on this subject to those who are willing to hear her voice, when she not only provides fresh food and pure air, but casts all impurities to the ground, where they are either absorbed, or their deleterious gasses are dissipated into the changing air.

While the worms are moulting they should be left quite quiet and undisturbed, and even loud and sudden noises should be avoided, as well as the shaking of the trays upon which they rest, for even the violent concussion and vibration of the air will cause them to start suddenly up as if frightened, which acts injuriously upon them, by rousing them from that semi-lethargic state of repose, which at that season is so necessary to their welfare. Of course during this time no food is administered to them. On no account should a worm when about to moult be moved from the leaf, or other spot whereon it stands, for by so doing the hinder feet become detached from the silken web which bound them to it, and the insect is often thus rendered unable entirely to disengage itself from the old skin, from the loss of the hold of the anal feet upon the leaf, and which hold, serving as a lever, or *point d'appui,* enables it, as it were, to crawl out of the skin, which remains behind firmly fixed to the spot which the hinder feet had occupied.

In the hatching of the worms, if the eggs are attached to paper, cloth, or other substance, there is no difficulty whatever experienced in effecting the exit, except sometimes when they are two closely deposited ; but when, as is the case with the Cashmere stock *(B. mori)* the eggs are loose and unattached, unless the young brood is narrowly watched, many will be unable to cast off the eggshell from

the anal and penultimate segments, and in such case they will die from the constriction of the hinder part; in order to guard against this accident, which is very frequent, the French, ingeniously make use of a card, or sheet of stiff paper, pierced with numerous holes, of sufficient size to allow the young worm to pass through, but not large enough to admit the eggshell, which is consequently thus scraped off as the worm passes through to the light, the cards being placed over the mouth of the vessels in which they are hatched. On this point, then, a question arises as to why the eggs of *Bombyx Mori* are loose, while those of the *Madrassee*, the *Dasee*, and the Bengal annual (*boro-poloo*) are all firmly attached to the cloth, or paper, upon which they may be deposited?

It is very clear that, in its original state of freedom, the moth must have attached the eggs, like other species of the genus, to the leaf, or to the bark of the tree, for if scattered about broad cast, as they now are, without adhering at all, they would have fallen to the ground, and been lost. Can this be another symptom of disease? I am strongly inclined to regard it as such, for the two reasons that to be unattached is *unnatural*, and because that although the vast majority of the eggs are loosely scattered, a few will invariably be found adhering, though with no great tenacity, to the cloth, or paper; proving, I think, thereby, that they ought all to be thus attached, and that the reason why they are not, is to be traced to the fact of weakness in the insect, which has not the power to secrete the gum necessary to cause adhesion.

If it be urged against this view, that in the Bengal annual (*B. textor. nob.*) the eggs, even when greatly diseased, will still adhere to the cloth, I reply that this does not by any means prove the Cashmere stock to be sound, but simply that disease is situated *in some other organ*. In the *boro-poloo* of the Bengalis, it is *the egg itself* which is diseased,

as shown in the variety of colours, in the irregularity of hatching, moulting, &c.; but in the Cashmere stock, it is seated in some particular gland *in the moth*, which fails to produce the gum by which the egg should become attached; and that this non-attachment of the egg is the fruit of disease, is seen in the fact that the worm often experiences the greatest difficulty in freeing itself from the eggshell, and indeed often dies through its inability to do so; and hence the necessity of resorting to the artificial process of placing over the eggs papers pierced with holes, for the avowed purpose of assisting nature, who, in the absence of disease, requires no aid whatever. It is, indeed, scarcely to be wondered at, that insects exported from their native land and climate, and reared through a long course of years in an artificial, and in many respects highly injudicious manner, should, sooner or later, betray symptoms of weakness and disease; the marvel is, that we have so long been able to preserve any stock whatever, rather than that we should now be compelled to inquire into the means by which it may be saved from utter ruin. It is not in the worm alone that disease is apparent, nor is it exhibited under one phase only, but appears to be as various as the causes which have tended to produce it. There is disease in *the egg*, disease in *the larva*, and disease in *the moth*, affecting one or more of the secretive organs, as shown in its discoloration; the natural colour being a purplish grey, or slate, any marked deviation from the type must be regarded as unhealthy and unnatural. This variation from the typical colour is chiefly exhibited in green, brown, and various red tints, the worms produced from which being often of a sickly yellowish green colour, like that which is sometimes apparent on very damp walls, and there is generally great difficulty experienced in casting off the old skin at the moulting periods, the penultimate and anal segments remaining hampered and tightly bound up by the entire

skin, which, having forced back so far, the worm cannot disengage from the anal extremity, and, consequently, unless assisted, dies. Others exhibit a black spot, or spots at the junction of two of the segments, or annulations of the body, and die suddenly at different stages of growth, emitting almost immediately after death the most intolerable and offensive odour. Some again arrive at maturity, but instead of spinning the cocoon, become of a bright turmeric yellow, as if suddenly attacked by jaundice, leaving a watery yellow trail behind them; these also die. Others will spin a tolerable cocoon and die within it, spoiling the silk by their putridity; some turn to pupæ without spinning at all, and many spin merely a thin cocoon containing but little silk.

This deficiency of silk has, however, in some quarters been attributed, not to disease in the worm, but to a sudden change of temperature at the time when it began to spin. This view of the case is most decidedly erroneous, since if change of temperature caused the worm to cease spinning, death would be the inevitable consequence, and instead of a chrysalis, or pupa, the worm itself would be found in the cocoon with its silk reservoirs *still unexhausted.*

A little reflection must serve to convince any reasonable person that when the time has arrived for forming the cocoon, nature *compels* the insect to give out its silk; and it has no more power to resist the laws of nature by withholding it than has one of the more highly organised animals to refuse to bring forth its young when the hour of its nativity has arrived; like the higher animal, the silkworm is but an instrument in the hands of its Creator, and must necessarily and unresistingly obey His will. When the breeding season comes round, the bird can no more refrain from constructing a nest, than can man refuse to die when his appointed hour has arrived. And thus is it throughout creation, each animal being governed by certain beneficial laws, which compel it to perform its allotted duties,

not only to secure its own individual welfare, but likewise, as being a link in the chain of nature, to contribute each, in its own degree and station, to the well-being of the universal system.

Hence the silkworm being an unreasoning animal, which knows not why its actions are performed, is guided and compelled by certain inward promptings and impulses, which we term *instinct*, to carry out the object for which it was created, and it has no more exercise of volition in the formation of its cocoon than has the moth in the selection of the species of tree upon whose leaves her offspring is destined to feed; they are but the unconscious and unreasoning machines which mechanically give effect to the wishes and the intelligent reasoning of their Creator.

When, therefore, the worm has arrived at maturity, nature prompts and compels it to spin its cocoons, and if that cocoon is deficient in silk, it is either because from some cause the worm died before its labours were completed, or because from sickness the gum secreting glands had not been able to produce the proper quantity.

Again, in the moth, disease is shown in the unproductiveness of the eggs, even after coupling has been effected; it is shown, likewise, in black spots appearing at the junction of the annulations of the body, which are indications of a malady which prevents the insect from depositing, or relieving itself of, the ova with which its body is sometimes painfully distended, and so causes death ; in others the organs which secrete the gum, by which the eggs are glued to the substance upon which they are deposited, are unable to perform their office, and the eggs are, consequently, loosely scattered in the trays, giving rise, as previously observed, to a difficulty in casting off the egg-shell at the time when the young worm comes forth. The eggs, moreover, being themselves unhealthy, as shown in the variety of their colours, proves likewise that the moth which deposited them must be unhealthy too. If the ova

are healthy, those which were deposited on the same day ought also to produce worms on the same day ; diseased eggs are very irregular in this respect, and cause an immense deal of trouble. For instance, a batch of diseased eggs which were deposited in Bengal on the 21st and 22nd of March, began at Mussooree to hatch for a second crop on the 1st of Sept. following, but instead of all hatching on the 1st and 2nd of that month, as they would have done had they been healthy, they continued to come forth daily in small numbers until the end of November, so that although deposited *in two days*, they actually occupied three whole months in hatching, and were of course perfectly useless.

This inconvenience was attended with another, for those which were hatched together on the same day did not all moult together, and, consequently, gave additional trouble in the feeding, as they had repeatedly to be separated; and finally, instead of spinning together, they did so by twos and threes at a time, so as to render it difficult to obtain seed for the ensuing season, besides that many of the males were impotent. The cocoons were generally small, ill formed, and varied in colour, many of them being of a sickly yellow, instead of pure white, and others of a beautiful faint green.

All these ailments are undoubtedly to be traced to improper feeding, unsuitable climate, and the long continued artificial system to which the insects have been subjected, and the only remedies that can effectually restore them to health, must, in my opinion, proceed partly from the introduction of a more careful and natural system of rearing, and partly from the periodical infusion of fresh stamina derived from moths produced from eggs imported from the Northern provinces of China, to which the insects are indigenous. By these means fresh strength and vigour may be imparted to the constitutions of our present worn-out and debilitated stock, the trouble and the expense so incurred being amply compensated for by the improvement which must take place

both in the quantity and quality of the silk, and indeed, I shall presently show that without travelling to China for fresh supplies, it may be quite possible, with common prudence, to produce a natural stock both in Europe and in the Himalaya.

That sickness has been induced by an improper system of education is, likewise, the opinion of Count Dandolo, while M. Boitard finds the origin of some maladies to proceed, he thinks, from an imperfect fecundation of the egg, which occurs, he says, when the moths have been kept in too high a temperature, which he would restrict to between 68° and 75°, because in a greater heat the coupling proceeds too rapidly, and the eggs are in consequence imperfectly fecundated. But it may fairly be questioned, I think, whether eggs *imperfectly fecundated* will produce any worms at all, and it seems like something bordering on a contradiction, and Hibernianism, to say that they will. If fecundation is imperfect, the eggs cannot have been impregnated, and therefore will be unproductive; imperfect fecundation is tantamount to imperfect impregnation, and imperfect impregnation is no impregnation at all; consequently, on the principle of "*ex nihilo nihil fit,*" no offspring is to be expected from a non-pregnant female. A moth may be only *partially* impregnated, and will in such case not yield the proper number of *prolific* eggs, but at the same time all that have been fecundated will produce worms; these may be healthy or sickly according to the condition of the parents, but their eggs being hatched proves that they were fecundated.

I should feel more inclined to attribute disease to sudden transitions of temperature whether from heat to cold, or from cold to heat; to impurity of air arising from the imperfect ventilation of the rearing-houses; to malaria arising from the putrefactive fermentation of excrement and decaying leaves; to food of bad quality and insufficient in quantity;

to want of light, excessive heat, and various other causes, among which I would certainly include the senseless custom of chopping up the leaves for young worms; starvation during the night; keeping the leaves for hours after they have been plucked before giving them to the worms; and last, though perhaps not least, feeding them upon the leaves of shrubs, instead of upon the mature and wholesome foliage of old standard trees. Yet at the same time I shall not expect much improvement in the present state of things until the entire process of planting, feeding and reeling is supervised by the master's eye, the plantation and the worm being the property of the same individual, so that the whole process of cultivation shall be under the superintendence of one responsible head.

For the purpose of endeavouring in some measure to restore the health of the insects, by obtaining eggs from moths reared in a natural way, I have more than once advocated the experiment of feeding the worms upon trees in the open air, and it is, therefore, gratifying to observe that while, in India, ignorance and prejudice were endeavouring to bring the proposition into contempt, at that very time, as it now appears, the experiment was actually being made in France with signal success:—"M. Thaunaron, President of the Société d' Agriculture de la Drôme, having recently experimented with great success on the rearing of silkworms in the open air, and likewise in rooms not warmed. The worms in the house made their cocoons five days earlier than those in the garden, but of about 650 cocoons formed in the house 42 contained a dead black worm, which was not the case in any of the cocoons formed in the garden, though they were exposed to wind and rain."*

Similar experiments tried by me under very unfavorable circumstances, at Mussooree, both in 1858 and 1859,

* "*Comptes Rendus,*" as quoted by the *Illustrated London News*, Aug. 13th, 1859.

although not carried so far as to obtain cocoons, were sufficiently successful to prove that the worms will thus thrive better than when fed in the rooms, and the reason for this is, I think, to be found in the fact that the insect is always supplied with an abundance of good fresh food both by night and by day.

What could be easier, however, than in the large and well regulated green houses of Europe to obtain annually a supply of eggs from insects reared in the natural way on dwarf trees growing, not in tubs, but through the floor. Surely in those countries in which silk has become so important an article of commerce, it would be worth while to erect large buildings for this express purpose, and so insure a constant supply of healthy seed to renovate the present debilitated stock !

When the young worm has left the egg, and shows by its manner of raising up the head and forepart of the body, that it is in search of food, the youngest and tenderest leaves selected from the ends of the branches, should be gently placed over them, and upon which they will speedily crawl upwards to the light, riddling them with innumerable small holes, and as the leaves become sufficiently covered, they should be removed into the feeding trays. Chopped leaves, however time-honored the custom may be, ought on no account to be given, as this method of mincing them is by no means necessary, and is only a patent way of inducing the juices to ferment more rapidly than they ordinarily will do. Common sense and a little observation ought to point out that Nature is the best judge of what is necessary for the welfare of her productions, and as she does not appoint a leaf-cutter to attend upon young caterpillars when in a state of freedom, it is clearly because they are quite capable of cutting the leaf for themselves, having been furnished with strong horny mandibles for this very purpose. For *thirty years* past I have been in the habit of feeding and

rearing caterpillars of various species, and never yet experienced the slightest difficulty in inducing them to cut the leaf for themselves. I can only regard the custom of leaf chopping as one of those "old wives' fables" which originated, doubtless, with some tender-hearted ancient spinster, who, having lost her own teeth, considered *minced-meat* the most wholesome diet, unless, indeed, our silk cultivators, taking into consideration the fact that human infants are born *without teeth,* have in their compassionate wisdom determined that young caterpillars must be equally helpless. The custom, in short, is pretty much allied in point of utility to the superstition which in Assam gravely prohibits the individual appointed to put the caterpillars of the Moogah moth upon the trees, from using "*his razor for forty-five days, and from eating fish, milk, and the sweet torae*"!*

As the worms increase in age and size, so must maturer leaves be given to them, the best being obtained from old trees. The large and succulent leaves of young shoots, or of trees growing in damp soils, ought on no account to be given, as they contain an excess of water, and consequent deficiency of other more nutritious materials, such as saccharine and resinous matter. The small hard, rough and crisp feeling leaf of a mature tree growing in a dry soil, with the green coloring matter equally diffused, and of tolerable and uniform intensity, is by far the best adapted for preserving the worm in health, and enabling it to elaborate a full supply of serviceable silk. Where the colour of the leaf is of unequal intensity, appearing paler in some parts than in others, it is a sign that the juices are not in a wholesome state, and such leaves are to be avoided; they have this appearance most frequently after long continued rain and want of sun, and likewise towards the approach of autumn; it is induced, likewise by too much moisture in the soil which ought

* *Transactions Agri-Horti. Society of India,* Vol. 7, p. 99.

consequently to be drained off by trenches. The leaves of trees growing in moist situations, and stiff soils are never good; they are readily eaten by the worms, but contain an excess of water, and the silk obtained is of an inferior quality, and deficient in quantity.

Care should be taken as the worms increase in size, that they are not too much crowded in the trays, so that they may benefit by a free circulation of air, and receive their proper supply of nourishment, since without this precaution the stronger ones will suffocate, or starve the smaller and weaker. They should, in fact, be classed according to the time of hatching, each day's batch being kept separate from the others, otherwise it would be impossible to avoid disturbing those which, being hatched earlier, will also moult earlier. If the eggs are healthy, however, there ought to be little or no difference in the time of hatching.

Healthy worms are readily known by their plump appearance and hardness when touched, whereas unhealthy worms are soft and sluggish in manner.

When mature and ready to spin, small bundles of dry twigs tied together like miniature faggots, should be supplied, and among which the cocoons will be fixed, and here again attention must be paid to prevent undue crowding, or two worms will spin together, forming a double cocoon, which, from the interlacing of the threads, cannot be unwound.

The *Bombyces* have the power of producing a silken thread from the very moment of their exclusion from the egg, and even previous to their having taken any vegetable nourishment whatever,* a circumstance which furnishes decisive proof that silk is purely an animal secretion, and at once refutes the absurd opinion which is prevalent

* At page 150 of Part 2 of the Journal, Mr. C. E. Blechynden remarks that in the first stage of the caterpillar "the secretion of the matter for forming the future cocoon has not commenced." The above remarks will shew this to be an error.

in some quarters, that this substance resides in the mulberry tree on which the insect feeds; it would be quite as reasonable to assert that human saliva resides in a leg of mutton!

The mulberry leaf, by nourishing the worm, imparts a healthy action and vigour to the natural functions of its system, and thereby affects the secretions to the extent of sustaining and strengthening the action of the glands by which these secretions are produced; but that the silk thus secreted does not reside *as such* in the leaf or tree, is proved, I repeat, by the fact, that the insect possesses it at the very moment of its birth, and that *as silk*, it has no existence until the glands of the worm have elaborated it out of the substance upon which it feeds, or rather, until it has passed through the spinneret, since previous to that the secretion is simply a viscid gum, which has the property of hardening into an elastic silken thread, or fibre, the moment it becomes exposed to the action of the air.

"As soon as it leaves the spinneret," says Kirby, "it becomes the thread we call silk, which being drawn through *two orifices* is necessarily *double* through its whole length.

By the aid of this thread the young caterpillar possesses the means, when disturbed, of effecting a rapid descent from leaf to leaf, in order to avoid a threatened danger, or when in search of more palatable food.

In regard, now, to the cultivation of silkworms at Mussooree, experiments, tried upon the wild *Bombyx Huttoni*, have elicited the fact, that apparently little is to be expected from its cultivation, as all attempts to domesticate it have hitherto proved ineffectual; the only mode of rearing it would consequently, be upon the trees in the open air, and left entirely to nature. This mode of cultivation, if such it can be called, would, however, be always uncertain in its results, since the insects have so many enemies to contend against, such as birds, wasps and ichneumons.

Silk could no doubt, be produced, and of very good quality although scarcely in sufficient quantities to render it a lucrative speculation. Little could be gained from crosses with the Chinese species, because the wild worm being inferior to them, would return nothing equal to what could be obtained from them alone, and the time and trouble expended upon the cross, would, consequently, be thrown away.

It may be as well, however, to state the reasons which induce me to think that success is unattainable, and this I shall do as briefly as possible, at the same time premising that I do not yet intend entirely to abandon all attempts to reclaim the species; the experiment having been tried for so short a time, it is impossible to say decisively that it *cannot* succeed, although it is quite certain that it cannot do so in the very limited time allowed by Government.

My opinion, then, is founded upon the fact that the experiment now carried on for about eighteen months has shown.

First.—That the wild mulberry tree, when reared from cuttings, is found to be of very slow growth, and would require at least from five to six years, in order to bring it to a size capable of nourishing a sufficient number of worms to insure a tolerable return in silk. It is true the insect could be reared upon the Chinese mulberry, which is of rapid growth, but still it appears to prefer its own forest tree to any other, and thrives better upon it; and indeed while the wild tree is almost sure to have a brood of worms every year, the Chinese mulberry, unless far away from the other, will have none. Trees of the wild species, which are estimated by the Hill men to be five and six years' old, are not large enough to feed more than a dozen worms; in many of the nursery beds which contain, say, 2000 cuttings, not more than half a dozen have germinated; while the beds of the Chinese species, with the same soil, and entirely under the same influences, have nearly all sprung up into healthy trees of from six to twelve feet in height, in less than one year.

Secondly.—As regards the worm, the silk produced by it is decidedly good, and, produced in considerable quantities, would undoubtedly be valuable, a ready market being available at twenty-five rupees per seer. The worm, however, has hitherto proved so intractable, that it cannot be reared in the ordinary way in the house, and thrives only on the trees, from which, in this climate, on account of its numerous enemies, no certain crop could be obtained. This possibly might be rectified in Britain, where the pests which now destroy the worms are either few or altogether wanting, and I have accordingly recommended its introduction.

With a view to curb its restlessness and wandering propensities, I, with some trouble, effected a cross between it and the *Bombyx Mori* from Cashmere, but in every instance, with very few exceptions, the eggs thus obtained proved unprolific, and the worms produced retained all the intractable habits of the wild species; further crossing might possibly correct this, but would the results obtained be worth the trouble which the experiment would entail? It must be confessed, however, that the trial with the worm has not been carried far enough to enable me to form a decided opinion as to what may possibly be effected by further crosses, and I have merely here shown the effects of the first cross from which little could be expected.

The failure, however, if such it should eventually prove to be, detracts nothing from the value of Mussooree as a silk-producing district, since all the Chinese species thrive better in its climate than in any other part of India, while besides these we have several indigenous species of other genera, which are as yet untried, to wit, *Attacus Edwardsi*, commonly known as the Atlas Moth, but distinct from that of China, and which can be easily reared in a state of domestication, producing a large cocoon well stored with a fine, yet strong silk of a greyish colour; the plants upon which it feeds are indigenous and abundant, namely *Falconeria insignis and*

*Bradleia ovata. Actias Selene and Antheræa Roylei* are likewise far from scarce, and are easily domesticated, the former being almost omnivorous, and the latter feeding on the common Himalayan oak *(Quercus incana)*, yielding a very promising silk.

Added to these, we have a true species of Tussur found sparingly in the Deyrah-Doon, and which I have provisionally named *Antheræa Sivalensis;* and a very abundant species of Eria Moth, which can be reared to any extent, feeding on the *Coriaria Nipalensis* and *Xanthophyllum hostile.* This I have named *Attacus Canningi. (Nob.)*

The introduction of *Bombyx Huttoni* into Great Britain might possibly be attended with more favorable results than can be obtained at Mussooree, as the pests which destroy the worms would be left behind in India, and I accordingly intend to forward eggs to several persons interested in such matters both in England and France, as likewise cocoons of *Actias Selene, Antheræa Roylei* and *Attacus Canningi,* as the first thrives well both upon the wild cherry tree and walnut, while the second may possibly be reared upon the British oak.

Although, therefore, little may be expected from the wild Himalayan *Bombyx,* yet with so many untried species in this country, several of which might doubtless be rendered useful to commerce, it would be an undertaking alike honorable to, and worthy of a Government desirous to elucidate the resources of the country, and benefit mankind, to sanction experiments with one and all.

MUSSOOREE :
13*th November,* 1859.

---

*On the undeveloped resources of our Indian Empire*: *By Colonel* J. Abbott.

The insufficiency of the revenues of India to cover the expences of its Government under British rule, has long been a subject of grave anxiety to its rulers. Now and then, in prolonged seasons of peace, the revenue has covered all expences, and has even yielded a small surplus; but seasons of peace have been so rare and this surplus has been so trifling, that any hope of defying debt has been speedily dissipated.

They who read of the enormous riches of the Great Mogul, who see the magnificent and costly monuments this race of monarchs have left behind them; who have known the captured treasuries of petty principalities yield millions of pounds sterling, and who remember the loans to our Government of the late king of Lucknow, are sometimes disposed to think, that the country under British rule must have deteriorated, either in its land revenue, or in its commerce.

That this however is not the case is very certain. The area of the cultivated land has greatly increased under our rule, and commerce may be said to be of our creation, we have indeed abolished a variety of oppressive taxes, which were utterly unjust, which fettered commerce and impeded intercourse; prevented the hapless ryott from selling the produce of his labor, and which opened a wide gate to minor acts of oppression. The Government has even had the wisdom to remit two millions of land revenue, which were over and above the possible strength of the cultivator, and which, in breaking his heart, was desolating the country.

Nevertheless the revenue gathered under British rule is far greater than was ever enjoyed by any monarch of India.

It does not suit the limits nor the purpose of this paper to examine particularly the causes of such an extraordinary excess in the expense of British management over that of

the Mogul Emperors. It may suffice to observe, generally, that little expence is needed in a system of Government which does not protect the rights of all classes of its subjects: which provides no pensions for its servants whether Civil or Military, takes no care of the public roads, pays its soldiers at the rate of ordinary laborers, and its civilians by the plunder they can extort from the people under their rule. That the treasury of a Despot has many sources of supply besides those sanctioned by law, as for instance the bribes received for the nomination of individuals to posts of honor or emolument; the confiscation of property of obnoxious individuals, amongst whom are to be reckoned all that are wealthy enough to attract the sovereign's notice; the bribes paid by convicts to escape punishment; and the inheritance by the crown of the property of all who die without offspring.

The royal treasury may in fact be regarded as a vast reservoir, into which were drained all the fortunes made by commerce, and all the wealth gathered by the oppression of subordinate rulers; a plea of forfeiture being never wanted when the monarch's eyes had grown red upon the possessions of the subject.

As for wealth amassed by the rulers of petty states, like that of Bhurtpoor and Oude, it must be remembered that these States being fenced around by the armies of the supreme power had nothing to fear from foreign invasion, so that a large standing army and war, two of the greatest taxes on revenue, were unknown.

We have also to bear in mind the enormous expence of our British troops in a climate where they die in a time of peace at the rate of ten per cent per annum, each recruit having cost the Government one hundred pounds ere he can reach his regiment.

As for the noble works of art left by the Emperors of Delhi, magnificent as many of these are, we must not suppose

that the builders for a despot received always or often the full wages of their labor. Much of the works was compulsory, much was paid by food alone to the individual, for the day, his family being left to starve; and it may be doubted whether all these works erected during the 800 years of Muhummedan dominion are to be compared with the great trunk road from Calcutta to Attock, constructed by the British Government, amid all its difficulties (for no vanity of display, but for public utility,) during the last thirty years.

How enormously our expences are increased through the late Sepahi rebellion it is needless to state, the European force having been six times multiplied.

The lands and pensions forfeited by rebels will cover but a minute portion of this increased expenditure. The necessity therefore is urgent of turning to account all the sources of wealth India possesses. It is the purpose of this paper to draw attention to two or three which have as yet lain dormant, although they may not have escaped perhaps the comments of other observers.

Why must India, which possesses every possible variety of soil and surface, and a latitude ranging from 6° to 34° North, why must such a country import its wine ?

This question was answered 1900 years ago by Strabo, who speaking of Nursee, which lies just beyond the Indus and opposite the Northern portion of the Punjaub, says of its wild vines, " but it produces not fruit, for the cluster perishes before it can ripen, on account of the rains."

This seems to be the efficient cause of our want of wine, the produce of India. The Hindoos were not a wine-loving people, and it may be doubted whether they possessed the grape South of the Sutlej, before the Muhummedan conquests. The Muhummedans, though partial to the grape as a fruit, were forbidden by their religion to convert its juice into wine, and kings and nobles who set at naught these restrictions, and in secret indulged in the forbidden juice,

were probably supplied chiefly from foreign markets, or were content with the strong distilled waters of India. So that I have no where met with any account of Native Indian wine either in past or present days.

A friend of mine some years ago, when I was staying at Bareilly, made a few bottles of wine from the garden grapes of that place, and notwithstanding his complete inexperience, it appeared to me to be equal to genuine Madeira. But, as Strabo has observed, the heavy fall of the S. W. Monsoon in June, when the grape of India is ripening, destroys the clusters, and is probably the reason why, after fifty years' possession of Hindustan, we still have no Indian wine. The great heat of that season, also, may be prejudicial to vinous fermentation, but upon this point I am not well informed. A few grapes reared with *care* in gardens escape this destruction, at favourable seasons, and form a welcome addition to our desserts. It may be doubted whether this grape could be ripened in vineyards upon a scale sufficient for the manufacture of wine, at any rate the whole crop must be lost in those seasons where the rains set in early and heavily. The desideratum, therefore, is a vine whose clusters ripen at a season favorable to this process, and to the process of vinous fermentation.

Such a vine flourishes in great abundance in the Pergunnah of Asseer, District Nimarr, Central India. Its fruit comes to maturity, so nearly as I can remember, in the month of April or earlier. This is not the effect merely of climate; for in the same district the ordinary grape of India ripens in June. It seems to be a property inherent in the plant, and would I doubt not exhibit itself in higher latitudes. At any rate, the whole Peninsula of India would afford ample space for vineyards, sufficient for the supply of the whole world; and the most rocky and arid tracts, at present producing nothing, would be found most favorable for the culture of the vine.

The grape of Asseer, to which I allude, is of an amber color, large, of spherical figure, and is rather fleshy than juicy. It is a pleasant grape for the table, but I do not remember that it is remarkable for any very decided flavour. It is reared by the native gardeners in large quantities, and is carried in hampers upon ponies' backs to stations around Asseer to the distance of a hundred miles. The quantity of fruit even now produced at Asseer would suffice to make many butts of wine yearly; and there could be no limit to the produce. Upon this vine might be grafted the vines of France, the Rhine, Madeira, and Spain.

The pergunnah of Asseer where this vine flourishes, is a stony tract on the right or Northern bank of the river Taptie, and at the foot of the Sutpoora hills. Its elevation above the sea's level I should judge to be about 600 feet, but I have no memorandum. It is particularly well adapted to the production and to the ripening of the grape, but probably the land immediately at the foot of the Vindhya precipices would excel it in these respects: the reflected heat from a precipice 1200 feet in height, and having a Southerly aspect must be enormous. So far as I remember, all such land lies at present under dense jungle, and is generally too stony for any produce but that of the vine or fig.

The whole peninsula of India, indeed, from its stony soil and glaring atmosphere, I should suppose very favorable to the growth of the vine, and to the ripening of its grape; and that portion of it which lies under the lee of the Neilgherri mountains about Madras, having no rains in June, might produce wine from the grape ordinarily grown in India.

Gentlemen of the Madras service may be able to afford much interesting information upon this subject: for it seems probable that the grape ripening in April is not confined to Asseer but may be found in other parts of the peninsula of India; they may even be able to throw some light upon

its origin. Were not the vineyards of Asseer entirely in the hands of native cultivators, I should be tempted to suppose this vine imported from the Cape. Indeed I doubt not that the vines of the Cape might be easily transplanted to our Indian peninsula, where they would ripen their clusters in March or April.

The great distance of India from Europe, the depressing influence of its climate, upon Europeans, the ignorance of its population, and their slowness to acquire arts unknown to their fathers, the isolation of individuals coming out as adventurers, and, above all, the necessity of sending their children to England for education: all these causes render the speculations of private individuals hazardous in the extreme, and I believe it would be quite necessary that the Government should set up the first model vineyards and wine-presses, if it wish to see the project successful. For supposing complete success in rearing the vine and preparing its juice, yet it must be sometime before any market could be found for a wine wholly unknown to commerce. It seems to me, that Asseer, where the grape already flourishes, would be the best field of experiment upon that particular grape; but, simultaneously, vineyards of the ordinary grapes of India might be planted on the Madras coast out of the influence of the rains.

In Afghanistan, in order to obtain as much reflected heat as possible, trenches about 3 feet in depth are dug in parallel rows from East to West. The earth is piled on the Northern edge of each, and the vine is planted midway, throwing its branches above, below, and on either side, without any trellice to support them. This is a cheap and clumsy representation of our garden wall, and, I rather fear, would not answer in India, where so much rain falls, and where all kinds of grape-devouring vermin, from the jackall to the worm, are so numerous. As a substitute, I should recommend rows of brushwood four or five feet high,

planted East and West, and sloping backward from the South. Where the vicinity of the jungle would not afford these, the bushes might be lopped low, and left self-supported, as in the vineyards of France and the Cape. The place in rear of each row might have a slight inclination to add to the reflected heat of the sun.

How little right particular soils and climates have to boast of their exclusive faculty to grow particular wines, may be argued from the fact, that the Cossack Hetman, Platoff, after the great campaign of 1815, grafted the vines of the Rhine upon the stock of the River Don, and that the produce of these grafts (the Russian Donski) is scarcely, if at all, inferior to the wines which we drink as champaigne.

I know not why the same experiment should not succeed in India, when once we shall have overcome the difficulty of ripening our grape at a season suited to perfect the flavor of the berry, and to favor the process of vinous fermentation. There could be no difficulty in procuring from the vineyards of Europe specimens of the soils producing the finest flavored grape of each variety, and (after analysis) of supplying to our own soils any substances of which they might be deficient.

In the Punjaub, the vine grows readily wherever planted. In the valleys North of Rawul Pindee, it is usual to plant together a mulberry tree and a vine. The vine twines over the mulberry, and they form together a beautiful picture. At present the grapes there found, whether white or purple, are small and not remarkable for flavor; being in fact almost wild, and, not being grafted, manured, nor pruned. Those who take interest in their gardens rear excellent grapes.

So little rain falls in Peshawur, that I imagine the grape ripens there perfectly in June. In Mooltan there is no heavy rain at that season. The ordinary grape of the country might therefore be there grown for wine.

The same may be said of the Dirajat or right border of the Indus from Kohât to Mittunkôt, and applies especially to the whole of Sinde.

It may be argued that any benefit to the revenue from this speculation must be remote and limited. That it cannot be immediate is certain: but supposing it to succeed, that is to say, supposing that a saleable wine is produced, there can be no limit assigned to its extent; and it is to be observed, that it is one of those branches of industry, in which the European may be employed without detriment to the native cultivator; but, on the contrary, greatly to his advantage.

The colonization of India by Europeans, in its broad acceptation, is a thing impossible. Nature has set her face against it, in terminating the race after the second, or, at most, the third generation. The mixture of British with Indian blood, no man who has a due sense of his obligations to his race would ever advocate; and if it be considered that the profits of a years' labor to the ryott, after paying his rents to Government are from 3 to 7£ per annum, that a zemindar, or squire, receives as his share of the rents of an estate from 5 to 15£ per annum, whilst no European gentleman can live in India on less than 2 or 300£ per annum, which sum would merely secure existence, without any means of providing for the education of his children, or his own eventual retirement, we shall perceive that there is no place in India for the Englishman as an agriculturist or a zemindar. That his occupation of the first is impossible; that his assumption of the second were a gross wrong to the host of native zemindars who must be displaced for his benefit.

But there are some manufactures which *can* find remunerative occupation to Europeans, and wine, I feel assured, is one of these. In sugar, the manufacture of which is familiar to the native time out of mind, and which, before we entered India, he had brought to considerable excellence,

the native will always be able to undersell the European, because his personal expenses are twenty times less. But in the manufacture of wine, as in that of indigo, the superior knowledge and energy of the European will ever give him the advantage.

Now, although colonization in its extended sense be impossible in India, yet is it of importance to the stability of our empire, that as many Europeans as possible should find occupation upon the soil. The influence of even two or three respectable Europeans, in a district, in times of trouble, is often very great, in the preservation of order; and, where they can band together in parties of twenty or fifty armed horsemen, they may suffice to keep in awe an extensive area, and to support the authority of the Magistrate. Let us remember that a hundred sailors sufficed to preserve the peace of the large city and district of Dacca, although there were two companies of mutinous Sepahis there.

The time is come for the nation to make up its mind, whether gradually to relinquish as we civilize India, or endeavour to hold it for ever. The former alternative, *if possible*, were perhaps the more sane, until, however, it be resolved upon, we must by all possible means turn to account the resources of the country, and strengthen our footing upon its soil.

Does any philanthropist here exclaim—"Wherefore increase the means of drunkenness and debauchery, of which man already has more than enough?"

I answer, the brutal habit of intoxication, so disgraceful to the lower classes of English, and to some other Northern nations, proceeds, not from the immoderate use of wine, but from the abuse of spirituous liquors, learnt by the lower orders, who cannot afford to purchase wine. It is impossible to prevent the production, or to limit the supply of raw spirit; but, were pure wine cheapened, the use of spirits would gradually abate.

Drunkenness is not the sin of peoples who can drink pure wine, but of peoples who, being denied that luxury, have recourse to base imitations. There is no doubt that wine is a blessing to the countries in which it grows; where it cheers the heart of the over-laboured peasant, and is so much an article of diet, that he never thinks of it as a means of excess.

But let us consider it with regard to India. I do not hesitate to say that thousands are poisoned every year by the atrocious compounds passing current in India as wine, compounds into which no drop of grape juice has ever entered. It passes down the throat like molten fire, creating intolerable thirst, and tormenting the nerves it was taken to soothe. It is alcohol distilled from the fermented bark of trees, and from substances too disgusting to be mentioned. The quantity of water to dilute it, the color and the flavor are chemical secrets well known to wine manufacturers. Many wines, bearing highly respectable brands, are of this deleterious quality. In the Upper Provinces of India nothing less poisonous can be purchased. The introduction of pure wine as a substitute for this, would prove an undoubted boon to all who require, or fancy they require wine. And as, by the introduction of beer, our European soldiery have been greatly weaned from the immoderate use of spirits, so by the introduction of pure and cheap wine (and the Indian growth could undersell the world,) he might be almost entirely cured of his addiction to a potation which is degradation and death in a liquid form.

---

## Fibres.

The next neglected branch of industry occurring to me is the flax plant. This elegant plant is sown profusely in Rohilcund and some other districts, and from its seed linseed oil is exprest, under the name of Ulsie-ke-tel. But the use of the fibre is utterly unknown, or was so, in 1858-59,

when I was in that district. The plant, after threshing out the seed, was either burnt or ploughed into the soil as manure. I feel assured that any capitalist familiar with the process of preparing flax, might make a large fortune in Rohilcund; because he could there purchase the fibre for almost nothing.

The use of the fibre of the hemp is also unknown to the natives of India; who have no substitute of equal strength and durability. It grows wild in all parts of the country; and in some districts its leaves are gathered for the preparation of *bhang*.

It could not be collected in sufficient quantity for manufacture, unless sown for the purpose. I do not think the use of its seed to supply oil is known in India.

In 1843, when I had political charge of Nimarr on the Nurbudda, hemp seed was sent me by some Horticultural Body for propagation. Having never seen the hemp plant in Europe, I was not aware of its identity with the *bhang* plant of India, and was amused (when the seeds sprang up) to find that I had been propagating a common weed.

The culture of British hemp for exportation might become a very profitable speculation, now that railroads are being established in India. There are indeed several plants, the bark of which the natives employ for hemp: but none of them can compare with the fibre of the hemp plant in durability or strength; its oil also would be turned to account. There is no limit to its culture excepting that of hands to cultivate it, but whether its fibre would be equal in quality to that of the hemp of Europe I cannot say. The hemp plants of India have this to recommend them, that they refresh soil exhausted by a crop of wheat. This they effect probably in consequence of the rain water being detained to some depth about their roots, by ledges of earth raised around the field, and this of course accelerates the process of decomposition in the soil.

There are in India vast tracts of culturable soil lying neglected, less for want of inhabitants to cultivate them than from the objection of the natives to migrate to a distance from their birth-place. Thus the Bareilly district is so over-crowded with cultivators, that soil which produces almost no return is brought under the plough, and the energies of the ryot are exhausted in ploughing land which will not feed himself and children, and this land which should naturally be left to produce a trifling quantity of grass and jungle for the use of the cows and goats of the village, is taken up with unproductive labor, and the cow and the goat starve. Owing to these circumstances, a district which is the garden of India to the eye, is found on closer knowledge to be an arena on which men and cattle are trampling one another to death. The food of the agriculturist is most scanty and wretched; life is scarcely supported by it, and strength is out of the question. He degenerates every year in size and form, and his wretched cattle have already dwindled to anatomies. Yet around him at no great distance lies good arable land wooing him to cultivate it.

There is very prevalent a superstition which rates the prosperity of a district by the number of its inhabitants; but if the land was made for man, and not man the land, that district is most prosperous in which the plough has left ample space for the fuel of man to grow, and for herbage for the cattle. In which man is not obliged to eat his bread half raw, for want of fuel; nor dry for want of milk or ghee; nor in quantities insufficient to support his strength, because he ploughs up the unproductive tracts with cattle, which are starving beside him: but, when he tills only the generous soil, has milk and ghee for his children, and fuel in abundance for culinary purposes. In Hindostan where grass seldom if ever grows spontaneously, and where coal is unknown to the natives, a very considerable portion of every

village must lie waste, in order to supply the inhabitants with pasturage and fuel; could each ryot be persuaded to cultivate in addition to his corn land, a field of lucerne or trefoil, much of the present misery might be obviated, and there would not be the same need of waste land. But according to present regulations, he would have to pay rent to Government for such a field; so that it is out of the question. But I have no doubt that if each ryot were allowed to hold free of rent, one good field of lucerne, the Government revenue would in the end gain rather than lose by the grant; because the cattle would be stronger and die in smaller numbers, and the men would be more healthy, and less thinned by death.

When I have urged upon revenue officers the duty of inducing their ryots to migrate from tracts where they were suffocating one the other; the answer has been, there would be a falling off in revenue, for which the Government would hold me responsible. But the object of a wise and just Government is not to wring the last farthing from the soil at the expence of the health, lives, happiness of the people; but to diffuse the greatest amount of happiness to the greatest number. Its real wealth being the happiness of its people.

In the Punjab, the opening of that magnificent canal will fertilize an immense area, which, since the creation of the world has produced jungle alone. The only want, here, will be a sufficiency of hands to occupy and cultivate the irrigated area. In India, the progress of occupation is slow. It might no doubt be accelerated were capitalists to settle on the spot, and to give advances for crops of hemp, after the custom of Indigo-planters.

At present the cultivator pays his revenue from cash borrowed of the village shroff or banker at an interest never less than 25 per cent., and often three times as much. This keeps him always poor, disheartens his efforts, limits the

number of his cattle, and prevents his doing justice to the soil he occupies.

But, to enable capitalists in full possession of their senses to make advances to ryots, a code of laws for their especial protection is necessary. It is to no purpose to say the law which protects the shroff will protect you. For the shroff who takes cent. per cent. interest can afford to sustain many losses, and to wait long for his money. Whereas the hemp-merchant, like the Indigo-planter, is ruined, if the crops for which he has given advances are not raised by the cultivator. A ryott having received an advance, and neglecting to plough properly, or to sow his land at the right season, should be liable to imprisonment until he could furnish security for better behaviour, or for the refund of his advance. And this should be by a summary process, and not through the tedious litigation of our courts.

The penalty which we have introduced into the country of executions in default of revenue, is the greatest curse with which the country is burthened; whether we regard the Government revenue or the hapless cultivator. It is universally regarded by the natives as a cruel and tyrannical invasion of inalienable rights: and in the eye of the philanthropist it is an insane and brutal exercise of force to save the rulers the trouble of more gentle and parental methods of coercion. It is fast desolating the country and impairing the revenue, and is our most efficient engine of unpopularity. But it certainly saves much trouble to a collector who loves his ease, and who, with a stroke of his pen, on the report of his tehsildar, can wrest from the cultivator the lands which he and his fathers tilled for hundreds of years, and turn him adrift upon the world to starve; which is the ordinary fate of such victims.

Under Native Governments the revenue was collected before the crop could be removed, failing payment an

adequate portion of the crop was seized. And as, under such circumstances, the loss was always very heavy to the cultivator, it was his interest to prevent this seizure by timely payment or security. This system prevailed in the Punjab when I had charge of Hazara. The system, no doubt, leads the cultivator in most cases to borrow his rent of the village shroff; but he borrows just as much, and just as certainly, when time is allowed him to sell his crop ere the Government demand is made. And this, must be the state of things, until railroads afford him ready communication with the great marts of the world, and renders him less a slave to the village banker.

Our system of penalties, promptly and rigidly exacted, when repentance is of no avail, may be unavoidable in a highly civilized and free land, where each is jealous of supervision, and considers his free agency his greatest privilege; but it is both insane and cruel with the poor dependent Native of India, who looks to his superior for guidance in all matters unconnected with caste and family, and knows no greater curse nor labour, than the obligation to think for himself. He needs to be treated like a child: to be gently compelled by the unslumbering vigilance of the collector to pay his revenues, whilst the means are in his hands. He thinks, and with some reason, that the Government which makes him work like an ox, and leaves him of his produce no more than is sufficient to furnish such food as is given to oxen; is bound to be at the trouble of thinking for him in all matters relating to revenue. He cannot understand the privilege of being left to himself to spend the money he has earned, and then to be turned out of the immemorial possessions of his fathers, to perish by starvation and a broken heart.

---

*General Observations on the Algerian Sahara, and its cultivation, by Mons.* E. COSSON : *Translated from the French by* HENRY COPE, ESQ., *of Umritsur.*

*To the* SECRETARY AGRI.-HORT. SOCIETY OF INDIA.

SIR,—There is, amongst the papers recently presented to the Imperial Zoological Society of Acclimatation of Paris, and published by that institution, in its *Journal,* a communication on the present condition of the Algerian Desert, and the measures adopted by the French Government, to increase its products, and improve its productiveness. It is highly interesting in itself, and contains so many hints and facts that might be useful in many cognate parts of India, Sind, and the Southern parts of the Punjab for example, that I venture to think its publication in this country might be of considerable advantage, and therefore, do myself the pleasure of sending you a translation, which is much at your service, if you think it worth a place in the *Journal* of your Society. Permit me to draw your attention to the fact, that the culture of silk is considered practicable in the sandy deserts of Algeria. Why not in any part of India ?

Yours faithfully,

UMRITSUR : HENRY COPE.

1*st September,* 1859.

---

The Algerian Sahara is bounded to the North by the southernmost mountains of Algeria, forming nearly a continuous chain, in an oblique direction, from South-West to North-east, from the frontier of Morocco and towards Batna, where they lose themselves in the vast upheavement of the Mount Auré. It results from this direction of the mountains, that the desert region commences in the West, at about latitude 33°, while in the east it advances to the 34th and 35th degrees. In the south it is lost in the vast expanse of the great Central African desert, which, as is well

known, extends to the region of periodical rains (12 or 15 degrees of latitude). The whole of this immense desert zone, somewhere about 500 leagues broad, is characterized by the extreme scantiness of rain, the dryness of the atmosphere, the absence of any high mountain ranges, or any permanent water stream, by the Caucasian type that predominates amongst the inhabitants, notwithstanding their frequent crossing with the Negro race, and finally by the peculiar desert character of the vegetation, which is so entirely different from that of the tropics.

The Algerian Sahara presents two general slopes; one from north to south, extending westward to the immense downs known under the name of aregs (quere alrey) in the centre to the vast depression called Chechia Ouargla, and eastward to the great chotts that mingle with those of the Regency of Tunis, while the other declivity, sloping from w[illegible] e[illegible] st[illegible] from the frontier of Morocco, has a mean height of 1,000 metres, and forms an inclined plain that gradually reaches the level of the sea to the south of the Regency of Tunis.

The soil of the immense plains of the Algerian Sahara belongs, in almost the whole of its extent, to a geologic period of considerably recent date, *viz.*, the fourth; the third system is found in very limited masses. Originally this Sahara has been to a great extent a vast gulf, covered to the south of the Regency of Tunis, before the formation of the powerful shore belt of alluvial soil, which at present separates it from the Mediteranean. The desert plains are formed of a compact soil, silicious, clayey, calcareous or gypsose frequently sprinkled with crystals of gypsum. This soil, by the alternations of humidity and extreme dryness, by the action of water and of impetuous winds, especially from the south, is easily soluble, and the silicious parts separate themselves more or less to form moveable sand; these sands are deposited, in certain directions, according to

the formation of the surface of the land, or the influence of certain prevalent winds, forming, here and there, superficial beds, small tumuli, or genuine downs.

The comparison between these plains and the ocean, where the oases represent either scattered islands or groups, affords a very correct notion of this vast region. The presence of water furnished by springs, by oueds or beds of streams generally dry in summer, but sometimes torrents in winter, and by the "redirs," depressions in the beds of the oueds where water remains for some time, as also the existence of wells, determines generally the formation of a station or encamping ground, and admits of the formation of an oasis with occasional towns and villages. The centres of the population are more or less numerous, or closer together, according to the quantity of water, or as the number of wells admit of more or less land being irrigated for cultivation. The most populous parts of the Algerian Sahara from east to west, are Ziban, Souf, Oued Rir, the country of the Ouled Nail, Ouargla, Beni Mzud, and the line of the numerous Ksours established in the provinces of Algiers and Oran on the verge of the high table land.

Under the protecting sovereignty of France, whose benevolent anxiety for their welfare is duty appreciated, the desert population, freed from the intestine wars which, before their submission, desolated the country, and protects them against the depredations of the wandering tribes, may now without fear, bring all their activity to bear on the extension and improvement of their cultivation, from which they were formerly constantly diverted by the necessity of providing for their safety. The oases of Ziban, influenced by France in the most direct manner, enjoy a state of prosperity which they never knew before. The Souf is equally prosperous. The Oued Rir, thanks to the Artesian wells, recently sunk, owing to the care of the French administration, is rapidly renewing the numerous elements of its

wealth. Aghouat and the neighbouring oases, are daily assuming a greater importance, which they owe to embankments, to the wells, and the norias which the French authorities have made every where. The most remote oases of the south, still almost exclusively governed by their own Arab chiefs, such as the Ngoosa and Ouargla, form an exception to this general state of prosperity; the same may be said of the greater number of the Ksours of the west, whither our influence is indirect, and some of which are still exposed to the incursions of the nomade tribes of Morocco.

Before alluding to the spontaneous vegetation, and of the cultivation of the Algerian Sahara, and of the introductions that might be achieved, it is necessary to give some idea of the meteorology of the country, to explain its peculiar condition. At Biskra and in the Mzub it only rains ordinarily in winter, and especially towards the end of that season. At Tigourt and at Ouargla, it happens that several years pass without any rain. As in all countries of the same latitudes, when rain does fall, it does not last long, but is sometimes excessively abundant. In winter the temperature falls much lower than on the sea shore, where frost is an exception. At Biskra, in the commencement of February, the thermometer frequently descends to 2° and 3°, and pools of water are superficially frozen. In the month of January 1857, on the immense down or aregs of the west, under latitude 32°, and at an elevation of 400 metres, Messrs. De Colomb and Mares record 5° 8′ of cold, while the register thermometer placed on the ground, and exposed to radiation, fell to 8° 8′. On the other hand, even in winter, the temperature frequently rises to 20° in the middle of the day. In spring, and up to the middle of June, these great alternations of heat and cold are not less remarkable; thus the thermometer rises at midday, under the action of a south wind, to 40°, while it frequently falls during the night to 10°. The temperature of the soil is still more variable; indeed, the sand

which, in the sun, during the month of May, frequently shows a heat of 40°, descends as often during the night to 10°. The damp of the sands of the downs, often of no depth, causes a depression in the temperature favorable to vegetation, and furnishes, at the same time, to the plants the quantity of water necessary to their development. Thus while the sand at its surface showed heat to the extent of 50°, only one decimer deeper, the thermometer fell to 25°. The water of a temporary well (hazzis) dug in the depressions of the downs, or in the sandy bed of the Oueds, and not more than two metres deep, rarely rises above 19°.

The dryness of the atmosphere contributes powerfully to these extreme variations of the temperature, which rises under the influence of the southern breeze to a maximum of 48°, and at Tougourt itself 51°. Another not less powerful cause of the variation of temperature is the frequently sudden change in the direction of the winds, which are occasionally very violent. The south wind often changes to north, and a moderate heat is followed by a state of the temperature nearly equal to that of Senegal. In summer, when the state of the soil has been increased by the action of continued heat, the temperature, even during the night, continues sufficiently high to be scarcely bearable by Europeans. The south winds (Sirocco, chyli, simoon,) are so penetrating that their effects are felt on the sea-shore. They do not, however, ordinarily last more than one or two days, and they are succeeded by a remarkable calm, or followed by an equally powerful blast from the north. The sirocco, so much dreaded by the traveller, and causing him so much pain, is not to be forgotten by those who are exposed to its effects for the first time. But its dangers must not be exaggerated, for if it does cause caravans to lose their way, it is only in very rare cases that it becomes really dangerous by the clouds of sand it bears along. This wind is one of the chief agents in the dispersion of plants; those cultivated and spontaneous that

characterize the Sahara ascend the valleys, exposed to its influence, sometimes to the height of 1,000 metres, while in the valleys that are not so exposed, though under the same latitude, the desert vegetation is but slightly represented, and there at an elevation not exceeding 300 to 400 metres.

The true summer of the Algerian Sahara, that is, the period when vegetation is at its greatest vigor, is represented by the months of April and May, during which the cereals attain their maturity.

The Date Palm (*Phœnix dactylifera*) is undoubtedly the principal element of the wealth of the gardens of the oases. It is cultivated not only on account of the abundance and variety of its products, but on account of its shade, which protects other produce against the violence of the winds, and preserves the humidity of the soil so necessary to vegetation. Thanks to this valuable tree, the presence of water is all that is required to fertilize the plains of the Sahara, which without it would be reduced to eternal sterility. The original country of the Date Palm is as little known as that of wheat, and of the greater number of the useful vegetables cultivated for centuries. Its presence every where characterizes the desert zone, almost destitute of rain, which extends from the Atlantic Ocean to the Valley of the Indus, up to the 64° of longitude, and which in Africa is bounded to the north by the 35° of latitude, and to the south by the 12° and 23°. On the Mediterranean shore of Europe the Date Palm is chiefly ornamental; it is only in the south of Portugal and Spain that it commences to ripen its fruit, but it is only as an exception, owing to the nature of the soil, by accidental circumstances, such as aspect and exposure to climatic influences, similar to those of the desert zone, which is the true habitat of the Date Palm. In Algeria, as in Morocco and Tunis, the Date Palm only forms oases to the south of the mountain range that bounds the Sahara.

The conditions essential to the success of the Date Palm are great heat, at least during summer, a clear sky, scarcity of rain, and an adequate amount of humidity in the soil. Thus the Arabs in their figurative language say that:—"This King of the oases plants its feet in water, and its head in the fire of heaven." The nature of the soil seems to have quite a secondary effect on its development. It thrives as well in the downs of Souf as in the compact sandy, clayey, calcareous or gypsous soil of the other oases. The water required for the use of the Date Palm may be sweet or brackish, cold or hot, the quantity being much more important than its quality. Extreme variations of temperature from 3° to 15° have no effect on the growth of this tree; nor do the winds affect it; they may blow with the greatest violence, but it continues to thrive.

In the majority of the oases, the Date Palm is watered by the irrigation canals (saguias) that are fed by the waters of the oueds or of wells. It is only under peculiar circumstances that artificial irrigation can be dispensed with, as in the Souf. The Date Palms are usually planted without order, at a distance of 4 to 5 metres from each other, and in well planted gardens the roots are kept carefully separate. They only form clumps when the owner has neglected to remove the suckers which frequently equal the main stem in height. The Date Palm is watered at all times of the year, but especially in the spring about the time of flowering, and in summer, when the fruit is ripening.

The mode of propagation generally adopted is the separation of offshoots from mature trees, this mode admitting of the propagation of female trees of the best quality only, and yielding fruit at an early period. It is nevertheless certain that the most esteemed varieties are obtained from seed, as is proved by the following popular legend:—"An old woman who feared God, consecrated her life to the glorifying of the most High and of his prophet. Being too poor

to purchase a rosary, she counted her prayers by means of date stones. When she died those stones, sanctified by her devotions, were buried with her. Net long after magnificent trees rose from this tomb, known as the origin of the Deglet Noor (Date Light), the King of Dates."

The Date Palm, after the first years, does not increase in diameter. Its trunk sometimes presents contractions of greater or smaller extent, corresponding with the periods of its development, during which it has suffered from drought, imperfect cultivation, or any other accident that may have delayed its regular growth.

Towards the month of April the Date Palm commences to flower, and artificial fecundation of the female trees is practised, by inserting into the spathe that contains the cluster of flowers a part of a cluster of male flowers. Every author agrees iu stating that trees left to themselves do not produce any fruit. There is in each oasis only a small number of male date trees, one tree being sufficient to fructify a large number of female trees.*

The variety of dates is not less numerous than that of most European fruits. They may be divided into two principal classes, hard dates and soft dates. The former are the most esteemed, on account of the facility with which they can be kept for any length of time, and transported to any distance. The soft dates can only be kept in jars, or in goat's skins, where they are pressed, as much as possible, to protect them from the effects of the atmosphere, and to delay fermentation. In each class the several varieties are distinguished by the size of the fruit, its form, its flavor, its color, the time of ripening, the shape of the stone, &c. The dates of Souf are those most esteemed in the whole Algerian Sahara, and rival those of Belad el Djerid, of the South of

* The practice of impregnating the date trees is common in Sind; but although it increases the quantity of fruit, it is not said to be absolutely necessary.—H. C

the Regency of Tunis. Monsieur D' Escayrae notices that in the latter province, the variety known by the name of Monokhir (nose), the length of which is more than two inches, is the most scarce and most esteemed. This variety does not exist in Algeria, and its introduction into the oases of the south should be attempted. It is not only the fruit of the Date Palm that forms such an important element in the food of the inhabitants of the Sahara; the central part of the young shoot, or the cabbage of the palm, is also in great request; by incisions in the stem, they obtain the milk of the palm, which by fermentation soon acquires a taste of wine (palm wine, lagmi), while the Jews obtain an alcoholic beverage from it (Kirchem) by distillation. The stem supplies the natives with wood for building and burning, the leaves are used for thatching houses, and for making mats, baskets, &c., while coarse ropes are made with the fibre of the spathes, and of the stems of the leaves.

The study of the several varieties of dates is beset with difficulties, on account of the uncertainty of the Arab synonyms, which differ in the several oases. The means of ascertaining the essential characters of the most marked kinds would be to gather together, in one of the oases of the south, all the most esteemed varieties, with the view of encouraging their cultivation. Although the nurture of the Date Palm has already attained a degree of perfection that leaves little to be wished for, it might be possible to obtain new results by the careful selection of male plants, and by the rearing of new varieties from seed.

Besides the Date Palm, we find, in most of the oases, a considerable number of fig trees, pomegranates, apricots (a variety with small fruit in abundance, that with larger fruit rare), and frequently the vine; peaches, quinces, pears, and apples are especially planted in the gardens of the Ksours, or in the oases bordering on the mountains. Still more rare, in the Zipan, are found the olive, the orange, and the

lime. The Barbary fig (*Opuntia Ficus Indica*), especially the thornless variety, is now and then planted alone, and more rarely in clumps. The *Acacia Farnesiana*, and the *Zizyphus Spina-Christi*, (found also in Egypt) the cypress, the linden tree, and *Elæagnus Orientalis* are only planted in isolated positions. Barley and more rarely wheat (*Triticum durum* and *turgidum*) are cultivated on the irrigated lands adjoining the oases, and between the date plantations; but neither of them is raised in quantities sufficient to meet the wants of the people, who are obliged to obtain the greater part of their cereals from the Tell. The Sorgho (*Sorghum vulgare*,) the Penicellaria (*Penicillaria spicata*,) and Indian corn, are only cultivated in wide-spread patches near the irrigation canals. Onions, beans, carrots, turnips, and cabbages are reared largely. The same of red pepper (*Capsicum annuum*,) whose fruit, on account of its stimulating properties, takes a place, as a spice, in all Arab dishes. The aubergine [a species of nightshade] and the tomato, are cultivated in some gardens on account of their fruit. Numerous species and varieties of *Cucurbitaceæ* are sown in summer in the gardens, where their fruits attain a large size. The Gombo (*Hibiscus esculentus*) is grown here and there by the Negroes for its edible and mucilaginous fruit. The Purslain often occupies extensive beds in the oases.* Coriander, cummin, fennel, and the *Anethum graveolens*, used to spice their food, are grown in many gardens where they are almost naturalized. Liquorice, in the Tougourt oases, is almost wild. The hundred-leaved rose, a variety of

* The natives, especially when travelling, gather for food every plant that possesses in any degree alimentary properties, and that may be found on the road. Shortly after the rains, they carefully seek the *Ferfez*, a kind of white truffle (*Choiromyces Leonis*) which forms a considerable part of their food. This under-ground mushroom, which is found at no great distance from the surface, indicates its presence by a slight upheaving of the soil, ordinarily split star-fashion.

peppermint and basil, are now and then found in a state of cultivation.

The Farm or forage plants are hemp, represented by a dwarf variety (*hachich,*) which is not employed on account of its fibre; its tops are, under the name of *tkhouri,* smoked by sundry Mahomedans of lax principles. The rustic tobacco is the only one that is cultivated, and no where to any extent except in the Souf. Henna (*Lawsonia inermis,*) the leaves of which have been recently used for dyeing in black, is hardly found any where but in the oases of the Ziban. Arab women use it, as is well known, to tinge their nails and their finger tips of an orange yellow. Madder (*Rubia tinctorum*) reared in some gardens on account of the dyeing properties of its root. It must at one time have been more extended, for the plant is naturalized in the greater part of the various oases. The cotton plant, of which the cultivation on a large scale has been attempted with success in the neighborhood of Biskra, is only represented by a few individuals in the gardens of Oued Rir and Souf. Lucerne is grown in small irrigated beds in the Souf, and in parts of the Oued Rir, where it furnishes as many as eight crops per annum. Fenugrec is only found in solitary instances.*

In the Souf the cultivation is peculiar, owing to the sandy nature of the soil. The Date Palm plantations are not arranged, as in other oases, in contiguous masses, sometimes numbering 100,000 trees; they are planted in more or less extensive excavations of a conical shape, dug by the hand of man in the sand of the downs, and in the underlying concrete lime to a depth sufficient to secure humidity, and the

* Several plants peculiar to the Sahara are sold in the markets as fodder. Amongst them are the *Cyperus conglomeratus, Helianthemum sessiliflorum, Atriplex Halimus,* and especially the Drinn (*Arthratherum pungens*). This grass, extensively found in the sands of the south, is much esteemed as food for cattle. Its seed is gathered under the name of *loul,* and as barley for feeding animals, and even as food for man.

people have to contest incessantly with the neighbouring sands. The humidity of the soil at that depth suffices to insure the growth of the Date Palm without any irrigation. All alimentary, useful and forage plants of this part of the country, whose cultivation is a victory achieved by man over the desert, are reared in gardens. These, which are frequently only a few metres in extent, are surrounded by hedges formed of dry date leaves, and watered by means of wells of no great depth, from which the water is drawn by a weighted bucket, of simple construction, commonly known as the goal. They are divided into several squares, into which the water is carried by small channels (rendered safe against absorption by a coating of plaister), so arranged that each plant receives the exact quantity necessary to its condition.

Towards the Northern limits of the desert region, the oases are generally established in the neighbourhood of the oueds, and ascend more or less the ravines or valleys by which these water-courses open out into the Sahara. These waters, by means of direct channels, or by embankments that raise the level, are exclusively used for the cultivated lands, which frequently exhaust them. In this first zone of oases, with exceptions such as at El Abio Sidi Cheikh, wells furnish the great bulk of the waters of irrigation.

In the interior, where the oueds are dry during the greater part of the year, and sometimes for several years consecutively, the stopping up and embanking of water are merely accessory means of irrigation, and water is permanently obtained from wells. The depth of these differs materially in various part of the Algerian desert.* When of

* The wells sunk in the beds of the oueds, on the depressions of the downs, and often on the open plains, are generally only a few metres in depth at certain points only, or in mountainous and rocky districts, as in the Mzab, they are occasionally from 30 to 50 metres in depth. The temperature of the well water is from 17 to 24.

no great depth the water is drawn, as we have already mentioned, by means of a weighted bucket called a goal. When beyond the reach of this apparatus, they are surrounded by a band of masonry flanked by two pillars united by a beam that supports a pulley; the bucket that brings up the water has a wide mouth, and is elongated below into a tube: this tube, fastened by a string to the principal rope that runs in the pulley, is lowered when the bucket is drawn above the masonry, and admits of the water flowing into a basin, whence it is guided to the irrigation canals.* The weighted buckets are the only ones we saw in the Souf. They also exist in some Ksours of the centre of the West. The second kind of well, the only kind used in the Mzab, is also found in several oases between el Oued and Ouargla, and in the West, particularly at E. Abiod Sidi Cheikh.

The existence in the Oued Rir of a subterraneous bed of water with the power of springing up, situated at no great depth (generally at a mean of from 40 to 50 meters), enabled the natives at a very remote period to water their oases by true Artesian wells. Square in form, and furnished above with a system of coffers made of date palm beams, they are dug with a very short-handled hoe, till the water can no longer be pumped out, or until the spring is reached. Then commence the labors of the divers, almost all Negroes, whose business it is to deepen the well till they reach the spring, or to remove the sand thrown in by the water. Every time they dive—and the duration of their immersion is about two minutes—they fill a small vessel that contains as much as two handsfull of earth. The difficulty and

In the Ziban, at El Amri, Monsieur Dubocq noticed wells that were only 1½ to 2 metres in depth. They pass through a rocky ledge and a small calcareous bank, some centimetres thick, below which is found a bed of water resting on a layer of clayey sand. In the province of Oran, on the edge of the desert, at Ain-ben-Khalil, is also found a superficial bed of water resting on a thin calcareous stratum.

* Exactly the same plan is adopted in parts of Rajpootana.— H. C.

tediousness of this work are easily understood, taking the circumstances and the primitive tools into consideration, as also the impossibility of repairing wells whose superstructure has fallen in. Before French occupation the obstructions in most of the wells of the Oüed Rir was the cause of the oases drying up, and some were even threatened with certain and speedy ruin. It is therefore not to be wondered that the people welcomed with joy and blessings the brilliant success that followed the sinking of the first Artesian well in 1856, under the auspices of the French administration, a success that proves that the whole of this part of the Algerian Sahara is destined to become, by means of Artesian wells, of which that of Tamerana was the first, the most fertile part of the Desert.

The water of the greater portion of the wells of Oued Rir contains a portion of sea salt and chloruret of magnesia, sufficiently considerable to be disagreeable to the taste and to act as a decided purgative. The natives themselves say of one of their wells, notorious for the bad quality of its water, that—" It is better to undergo a 100 stripes than to drink one mouthful of the water of Bram." In the brackish waters of the ditches of the oases of Oued Rir, supplied by the wells, there is an abundance of a peculiar kind of fish, allied to the Perch (*Glyphisodon Zillii, Valenciennes*), which appears wherever new wells are sunk. Indeed, this fish seems to exist quite as well in the subterranean beds of water from which the Artesian wells are supplied, as in the sheets spread in various parts above ground. It is to be found in hollows formed by the falling in of the native Artesian wells, and in some small deep lakes, of which the most remarkable are the Sea of Ourlàna, near the oasis of that name, and the Merdjaja near Tougourt.*

* Shaw (*Travels in Barbary*) notices the existence of a fish (probably the *Glyphisodon Zillii,*) in the waters of the oases of the south of the Tunis Regency.

The most prominent character of the desert vegetation is its uniformity, as shown by the same distinguishing species in places that differ as to height, the nature of the soil, or its residents. The total of the spontaneous vegetation of the Algerian Sahara, independent of the cultivation, does not exceed 500 species.* The greatest number are perennial, grow in tufts, and have a dried-up appearance, a stiff and hard carriage that imparts a peculiar character. Many species are more or less woody, but the only true tree is the Date Palm, other plantations in sundry oases only forming an exception. In the plains of the desert, sundry species of *Tamarix*, of which one peculiar to the south, the Ethel (*T. articulata*), extends to the country of the Touaregs, are almost the only woody plants that attain a tree growth. They form at certain points genuine forests, chiefly on the borders of the oueds, or the depressions that are damp in winter. One tree only recalls by its appearance those of our temperate region. It is a species of Lentiscus (*Pistacia Atlantica*), which, belonging more especially to the high table lands, advances southward to the valley of Oueden Nsa, beyond the 33rd degree of latitude.

If we compare statistics of the wild vegetation of the uncultivated lands about Biskra with analogous regions, we shall find that, of the 416 species that constitute the indige-

A letter from Monsieur Ayme, a French manufacturer, and Governor of the two great oases of Thebes and Garbe in Egypt, (read in 1838 before the Society of Encouragement of Paris, and republished in the Report of General Desvaux on the Artesian works executed in the Sahara of the province of Constantine in 1856 and 1857,) establishes the great analogy between the indigenous Artesian wells of the oasis under him and those of Oued Rir. Monsieur Ayme admits the existence of a subterraneous bed of water, and records the existence of living fish in a well he had sunk under circumstances when existing in the Oued Rir.

* The families represented by the greatest number of species are the *Compositæ*, the *Gramineæ*, the *Leguminosæ*, the *Cruciferæ*, and the *Salsolaceæ*. Certain families scarcely represented in other parts of Algeria, acquire great prominence in the desert by the number of species, and their importance.

nous flora of Biskra, 37 only are found in the centre of Europe, and 170 in the countries adjoining the Mediterranean; 119 are common to Biskra, and the desert regions of the east, and of this number 33 belong to the south of Spain; 74 species are peculiar to the south of Algeria, and to the Regency of Tunis. The reader will form a still more correct idea of the genuine affinities of the Algerian Sahara, by making a comparison with the vegetable statistics of the deserts of Egypt from Alexandria to Cairo, according to the most recent information; we shall find, indeed, that out of a total of 207 species found in that part of the Egyptian desert, 144 grow in the deserts of Algeria.

Its zoology equally indicates the affinities of the Sahara with the deserts of the east. The hare of Egypt (*Lepus Isabellinus*) is common; the gazelle, that also inhabits Arabia, is seen in numerous herds, and the *Antelope addax* of Nubia has been found on the downs of the west by Messrs. Colomb and P. Mares: several reptiles, the Wasan or Monitor of Egypt (*Waranus arenarius*) and the Cerastes or Horned Viper (*Cerastes cornutus*) are common to Egypt and the Algerian Sahara. The entomology of both countries is very analogous: the sacred Beetle (*Ateucus sacer*) and the Pimatur are as common in the sands of desert Algeria as at the foot of the Pyramids.

From these facts it follows that the Sahara is closely allied with the Eastern desert, as represented by Egypt, a part of Syria, Arabia, and Southern Persia. It is therefore in this region that we find a confirmation of the rule elsewhere laid down by us, that the interior is subject to influences depending on the latitude.* It may be said, taking geographical botany as a starting point, that the traveller moving southward advances nearer the east than the tropics.

From a consideration of all we have mentioned, it seems undoubted, that animal and vegetable life, which may be transplanted with the greatest probability of success in an

acclimatizing point of view, must be borrowed from the Eastern desert.

The two-humped camel, the most widely-spread beast of burden in Asia, and which also exists in Lower Egypt, might be introduced with advantage into Algeria, and might replace the dromedary, whose hair is of much less value in an industrial point of view for the manufacture of cloth.

Amongst the plants that might be increased or introduced with advantage, we will confine ourselves to the mention, amongst forest trees, of the poplars (*Populus nigra, alba, Euphratica,* &c.) various kinds of willow (*Salix Babylonica, pedicellata,* &c.), various species of *Tamarix*, the *Pistacia Atlantica,* already found in the mountainous parts of the desert, the Carob, Cypress, *Zizyphus Spina-Christi, Melia Azedarach, Cordia Myxa, Schinus molle, Elæagnus Orientalis,* various species of *Acacia* (*A. Nilotica, Arabica* and *Lebbeck*), important on account of the wood they might furnish or the gum arabic they would yield. The Egyptian Sycamore (*Ficus sycamorus*), on account of its rapid growth, of the hardness of its wood, and its shade, might be planted with advantage in recently formed oases, or in the neighbourhood of wells. Besides the fruit trees of Central Europe, such as the several varieties of peach, apricots, plums, &c., varieties of oranges, limes, and citrons might be multiplied and introduced. The existence of the olive tree in the oases of Biskra, where its fruit attains an unusual size, and the importance of its cultivation in some of the oases of the South of the Regency of Tunis, prove that it might be introduced into the greater number of the Algerian oases. The same may be said of the Caper, of which a wild variety already abounds amongst the rocks or stony ground. The Mulberry (*Morus alba*) grows well at Biskra, and by putting back the hatching of the eggs of the silkworm, as is done in Egypt, keeping them in pots, till the leaves are ready, one might add silk to the other sources of wealth of the oases,

where it would become as important as on the seashore. The Castor Oil plant (*Ricinus communis*) might also be largely multiplied as food for the *Bombyx Cynthia*. Amongst food-yielding plants, early wheats, especially those of Abyssinia, would allow, as it has been proved at Biskra, of the cultivation of cereals outside the skirts of the date plantations. On the banks of the irrigation canals, and at the foot of the Date Palms, certain varieties of rice, especially of the dry kind, as shown at Biskra by experiments, would no doubt succeed. The extension of Indian corn would be most valuable to the people, while lentils, grain, dolichos and lupins would be equally desirable. Amongst useful plants the cotton, henna, indigo, safflower, cochineal, might be grown on a large scale. Linseed grows in the oases; hemp would probably thrive as well, and sesamum, and ground-nut would no doubt answer. The sugar sorgho seems suited to the oases. To the forage plants already cultivated, such as lucerne and rye-grass, might be added Alexandrian clover, which in Egypt forms the staple of the food of the cattle.

The shade of the date palms, and the coolness of the soil consequent on extensive irrigation, have led to the successful introduction into many of the oases, by the French administration, not only of the vegetables cultivated in the warmer parts of the Mediterranean in Europe, but also the greater part of the fruit trees of Central Europe, including garden produce, of which some, such as the lettuce, the radish, the strawberry, belong to absolutely temperate climates. The general character of the indigenous vegetation, which in the oases consists almost entirely of species found in cultivated lands in Europe, indicates most clearly that the successful experiments already made can be generalized with facility.

In consequence of the extremes of the temperature being so great, even in the most favorable localties, tropical cultivation can only form an exception, and an object of curiosity

leading to no useful results. Moreover, the wealth already acquired is of sufficient value and importance to render it more desirable to devote attention to the improvement and extension of plants known to thrive, than new introductions. The country produces the olive, grape, fig, cotton, flax, wheat, potatoes, numerous cucurbitaceæ, the greater number of our European garden vegetables, henna, indigo, tobacco, &c., and especially the date palm, which has always been to man one of the most valuable of plants.

These are the chief practical conclusions of a journey through the south of Algeria, under the patronage of the Minister of War, and it is our duty to express our thanks to H. E. Marshal Vaillant, to Marshal Randon, and General Desvaux, whose protection has enabled us to perform our tasks successfully and safely. Owing to the means liberally placed at our disposal, and the anxious solicitude of the officers commanding on the southern frontier, Messrs. Colomb, Marguerritte and Saroka, we have explored the Algerian Sahara from east to west, and to its southern extremity, and collected numerous items of information that will form contributions to the proposed great work—*The Scientific Examination of Algeria.*

---

*Summary of papers respecting the irrigation of Cotton Crops.*

*To the* SECRETARY TO THE AGRI. AND HORTICULTURAL SOCIETY.

*Dated Council Chamber, the 26th October,* 1859.

SIR,—In continuation of letter No. 2187, dated the 30th September, 1858,* I am directed to transmit for the information of the Society, the accompanying copy of a summary of correspondence, communicated by the Government of Bombay, on the subject of the irrigation of cotton growing lands.

Home Department, Revenue.

R. B. CHAPMAN,

*Under-Secretary to the Government of India.*

* See *Journal*, Vol. X. p. 206.

*Summary.*

With the Government Resolution, No. 4699, dated 31st October, 1857, the two Revenue Commissioners were furnished with copy of a Despatch from the Hon'ble the late Court of Directors, No. 13, dated 9th September, 1857, forwarding copy of one addressed by them to the Government of India, in para. 13 of which allusion was made to an opinion expressed by Mr. G. Inverarity, Collector of Broach, in a letter dated 11th June, 1855, to the address of the Revenue Commissioner, Northern Division, as to the injurious effects of artificial irrigation on the cotton crop.

2. As directed by the Honorable Court, the Revenue Commissioners were instructed to obtain and submit to this Government the judgment of such Collectors as were most conversant with the culture of cotton, on Mr. Inverarity's opinion, and whether that opinion was correct to the extent to which he had laid it down.

3. Mr. Goldfinch, Collector of Sholâpoor, stated that artificial irrigation was considered altogether unnecessary, if not injurious to the cotton plant, and that he had seen some New Orleans cotton planted in irrigated land as an experiment, that failed completely, though the plant throve well in the same neighbourhood, and on the same description of soil without irrigation, so that, so far as his experience went, artificial irrigation was injurious.

4. The Collector of Belgaum, Mr. Seton-Karr, stated that he did not remember ever to have seen cotton grown under irrigation. He observed that a good fall of rain was of course necessary for the land in the first instance, that is, before the seed was put in, but that the time at which the sowing was made, viz., towards the commencement of the cold weather, or when the monsoon was nearly over, was a circumstance which seemed sufficiently to indicate that, after the plant had sprung up, and had obtained a few inches of growth, moisture would be injurious.

5. Dr. Gibson, Conservator of Forests, stated that he could not from experience speak of the effect of irrigation on country cotton grown in black soil, but that he had seen moderate irrigation applied to the Barbadoes, and the upland cotton grown in such land, with good result. He intimated that he could readily have the matter put to the test of experiment, by raising half a beegah in the garden at Dapooree, where the soil is mostly 2nd black, and comparing the produce as to staple and quality with that of a similar extent of cultivation at Broach, or Dharwar, Dr. Gibson added :—

"In the mean time, I may state my impression, which is this, that regular irrigation may not be found well suited to country cotton, but that, if water be applied, as is done in the case of wheat, and some other grains, grown in stream watered land, the effect on the staple would be beneficial.

"This application consists in flooding the fields containing the plant once or twice during its growth, viz.

"In the event of the latter rains being scanty, such a submersion of the ground would be required once in November and again in January, while the boll is filling.

"In the event, however of the rains being abundant in October and November, one watering only would be required, and that late in January.

"It is, I conceive, with this view, that the tanks described by the traveller How, as being common in the Broach Districts between 1780 and 1785, must have been kept up.

Selection from the Records of the Bombay Govt. No. XVI. New Series.

"That traveller speaks of irrigation as being then the rule, but I conclude that he uses the term in the same sense as that which I have above expressed, as it must be obvious that a single tank of earth material, as these seem to have been, could not have afforded a supply of

water at all adequate to the immense consumption of the element which regular irrigation in a cracky black soil must have caused."

6. The Collector of Ahmednuggur, Mr. Tayler, reported that, although cotton was but little grown in that collectorate, all that he could hear fully bore out Mr. G. Inverarity's opinion as to the effect of irrigation on cotton crops.

7. Mr. Ogilvy, Collector of Dharwar, stated that he did not find on enquiry, that irrigation was used for cotton in any part of that Collectorate, and observed that this might be owing to the fact that the plant was invariably grown in black soil, which was rarely irrigated, and was not considered so suitable for the purpose as other kinds. Mr. Ogilvy intimated that Mr. Channing, late of the Dharwar Cotton Experiments, having tried irrigation on a small scale, the crop of cotton was increased both in quantity and quality, and that he had himself seen New Orleans and other kinds of cotton successfully cultivated in a private garden, and in soil which would probably not be selected for the purpose by the native grower, remarking that it would thus appear that it had been determined by experiment, that cotton could, by judicious management, be irrigated with success, both in black and other soils.

8. Several Ryots who had command of water, had, Mr. Ogilvy stated, promised to try the irrigation of New Orleans cotton to a limited extent in different descriptions of soil, and he observed that many natives in his collectorate grew in the small gardens attached to their houses, a few plants each of two descriptions of Deokuppas, which they watered with the hand, that these plants grew into shrubs of some size, and were said to live for as many as ten years.

9. The question appeared to the Revenue Commissioner, Southern Division, never to have been fairly and fully tested, and he therefore submitted that Dr. Gibson be requested

to have the matter put to the test of experiment in the gardens at Dapooree, as suggested by him, and that Mr. Ogilvy be instructed to watch carefully, and report the result of the experiments, which he stated several Ryots, who had command of water, had promised to try in the Dharwar Collectorate.

10. Mr. Hadow, Collector of Ahmedabad, forwarded copy of a communication from the Superintendent of Cotton Experiments in his Collectorate, and stated that he inclined to Mr. Daley's views, that irrigation by occasional floodings at seasonable periods would be likely to prove beneficial to the crop, both as regarded quantity and quality. Mr. Daley stated, "Mr. Inverarity's remarks relative to the deterioration of the growth and staple of the Cotton crop by means of irrigation, applies to a certain extent to a cold heavy black alluvial soil, which retains water, by its gelatinous property, much longer than any description of soil, but even in that soil, when the pods are being formed on the cotton plants, the rain water having either evaporated or percolated to a depth of from 2 to 4 feet below the surface, I beg respectfully to state that if the plants were watered at this period, the growth and staple of the cotton crop would in general be improved, instead of deteriorated. These occasional floodings, however, would entail too heavy a water rate to justify its adoption to the culture of cotton alone on such a soil."

11. Mr. Gray, Acting Collector of Kaira, stated that cotton was cultivated to a very small extent in that Collectorate, and was seldom or never sowed by itself, but was always intermixed with the ordinary dry monsoon crops, and that he was enabled to state, from enquiries which he had made, that the cotton produced in his Collectorate was never artificially irrigated, and that if it were so, the young plant (as was supposed by those most experienced

and best informed on the subject) would get rotten and fail to attain to maturity. He observed :—

"It appears that formerly when Europe cloths were not in general use amongst the natives of Guzerat, a sort of vegetable wool called "Nurma," much superior to the cotton wool, used to be sometimes produced, and that very fine cloths were manufactured therefrom for the higher classes of the Native community. This "Nurma" plant, unlike cotton, was irrigated, and the crops which Dr. How describes as having been seen by him at the beginning of page 42 of the printed account* of his travels in Guzerat, &c., in 1787-88, were most probably "Nurma" (and not cotton) plantations, and this supposition is further strengthened by the fact, that he describes the color of the plantations he saw as being yellow, which is the color of the "Nurma" plant above alluded to. Should this conjecture be deemed to account satisfactorily for the statement of an eminent traveller made about 70 years ago, that at Ahmode, in the Broach Collectorate, the cotton plantations were watered from wells, &c. it would seem unnecessary to make further enquiries as to the probable effect of irrigation on the cotton crop, unless different or contrary opinions be entertained by persons of experience in its culture, in which case experiments to a small extent in the Broach Collectorate, would, I should think, settle the question more correctly and expeditiously than the conflicting opinions of different Officers consulted on the subject."

* Bombay Government Records. New Series, No. XVI.

12. Mr. L. H. B. Tucker, Collector of Broach, observed that the belief appeared to be universal among native cultivators, that to irrigate the ordinary indigenous annual, when growing in the deep black soil which forms the great mass of the arable land of these districts, would be injurious rather than beneficial, and that a reference to the very

Selections from Bombay Records, XVI. New Series.

interesting narrative of Dr. How's tour in Guzerat in A. D. 1787-88, for the purpose of enquiring into the system of cotton cultivation then existing, clearly shewed that it was at that time the practice to water some sorts of cotton, but that the inference drawn by Dr. Gibson in para. 8 of his preface to the *Tour*, that as a general rule two waterings were deemed essential to the proper development of the fruit, and the requisite length of fibre, was hardly, in Mr. Tucker's opinion, borne out by the details given in the work. He added :—

"The cotton to which Dr. How's attention was more particularly directed, was that species which yielded the long delicate fibre used in the manufacture of the filmy muslins for which India was in those days so famous; the plant which produced it was cultivated as a biennial, if not as a perennial, was generally raised in red or sandy soil, and undoubtedly required great care and a supply of water to ensure its yielding wool of the desired fineness. Its cultivation has been long extinct here, as the demand for it ceased when the muslin weavers of India were as a class ruined by the manufactures of England. The more intelligent of the Broach cultivators admit that cotton may have been irrigated in Dr. How's days, but maintain stoutly that the use of water was confined to the fine variety of cotton planted in red soil.

"I have never heard of the irrigation of indigenous cotton in the black soil, though I have seen it growing, chance sown, by water courses, and have been struck by its increased size and luxuriance, and the universal presence of insects in the bolls. It would appear to be irrigated in the Punjaub and in Sind, but, as explained by Mr. Inverarity, the rich alluvial soil on the banks of the Indus, and its tributaries differs altogether from the black cotton soil of Guzerat; wherever, however, irrigation has been had recourse

to with the exotic varieties, it would seem to have been attended with success, and I cannot help thinking that were it fairly tried with indigenous species, the prejudice against it which is by no means confined to the Broach District, might prove to be as unfounded as was the belief entertained by the ryots of the Southern Mahratta Country, on the first introduction of the American saw-gins, that their cattle would not eat the seeds of cotton which had been cleaned by the gin."

13. Mr. G. Inverarity, who had, in the mean time, been appointed Collector of Surat, after referring to the remarks made by him as Collector of Broach, and which led to the present call, stated that there was further strong *prima facie* evidence of the fact stated by him, that irrigation was injurious to the cotton crop, in the circumstance that cotton was never found grown upon land subordinate to wells, even where the assessment was light, which would scarcely be the case were the growth in such a position found to be a favourable one. He observed that he was aware that the facts stated by him were in entire opposition to what was published by Dr. How, who indicated very extensive means to have existed in those days for the irrigation of the cotton plant, but that it was very strange that no remains existed of the works which must have been used for such a purpose, and that the system of cotton cultivation adopted at the close of last century should have been so soon lost to the people of Guzerat, these too being of a nation who are slower than any in abandoning customs or prejudices. Mr. Inverarity intimated that he had frequent opportunities of conversing with Mr. Landon at Broach on the subject, and that he quite agreed with him on the unfitness of cotton for irrigation, and considered that Dr. How must have been greatly misled, by his inexperience of the people and the country, before he could have recorded the result of his observations in so erroneous a manner.

14. Mr. Mansfield, Collector of Khandesh, intimated that it was not the practice to use irrigation in the cultivation of cotton in Khandesh, and that there was no tradition among the people of its ever having existed. He observed that in the Western Districts of Khandesh, there were a large number of irrigational works, and that a considerable area of land was under irrigation, in which sugar-cane, rice, wheat, grain, and different kinds of vegetables were grown, but never cotton, notwithstanding its value in the market was much greater than of any of the above products, excepting sugar-cane and rice.

15. The Revenue Commissioner, Northern Division, stated that the purport of Dr. How's account of the cultivation of cotton by irrigation, attracted his notice when the book was first published, and as the following season his tour comprehended a great portion of the ground that Dr. How mentioned, he made frequent enquiries on the subject, and found that the people, almost without exception, ignored the idea of watering cotton, and mostly had never heard of such a thing. The explanation given by Messrs. Gray and Tucker appeared to Mr. Fawcett to be the probable solution of the matter, and he observed that irrigation was probably confined to some particular kind grown in the sandy soil which commences near Ahmode, and prevailed generally to the northward of that place.

16. The following Resolution* was passed by Government, under date the 19th June, 1858, No. 2069.

* Communicated to the Revenue Commissioners, Southern and Northern Divisions.

"It is certain from the reports now received, that agricultural practice under this Presidency is opposed to the irrigation of cotton crops, and the general belief is, that with the indigenous variety, at all events, irrigation would be injurious.

"2. It seems probable nevertheless that the flooding of the land once or twice during the growth of the crop,

would improve the produce both in quantity and quality. Dr. Gibson should be instructed to carry out the experiment suggested by him at Dapoory, with the view of testing this point, and Government are of opinion that it would be well, for the purpose of comparison, to plant an adjoining half beegah also with cotton, and leave it unirrigated. The produce grown upon these two half beegahs would be a fairer test of the effect of irrigation than the comparison between the produce of the irrigated half beegah at Dapoory with that of the unirrigated black soil of Broach and Dharwar. The Collectors of Surat and Broach should also be requested to make the same experiment during the ensuing season."

See paras: 17 and 20 of this Summary.

"3. If not very inconvenient, the experiment should be tried on different soils (both red and black) in each of the cotton growing Collectorates, a beegah of each, divided as proposed above into half beegahs, Government paying the ryots, whenever necessary, the cost of the experiment, or such compensation as may be deemed just.

"4. The Collectors and Dr. Gibson to be requested to give the experiment now ordered a very careful trial. In the meantime, the accompanying summary of the replies given by the officers to whom the subject was referred, may be forwarded to the Government of India in reply to their letter, No. 1753, of the 31st October last, and to the Hon'ble Court, with reference to its Despatch, No. 9 of 1857."

The necessary communications were made to the Government of India and Hon'ble Court.

17. In a letter addressed to the Revenue Commissioner Northern Division, under date 28th June, 1859, No. 368, the Collector of Broach, Mr. L. H. B. Tucker, thus reported the result of an experiment made by him:—

"2. An acre of black soil was selected at Broach, and one of red soil at Jumboosur, and great care was taken

to carry out the experiment completely; one half of each acre was left unirrigated. The other halves received each two copious waterings. The first in December—the rain having fallen late and plentifully—the second, while the bolls were filling.

"3. The return was as follows:—

*Broach Black Soil.*

| *Irrigated.* | | *Unirrigated.* | |
|---|---|---|---|
| Clean cotton | 41½ seers, | Clean cotton | 34½ seers, |
| Seed | 86¾ „ | Seed | 72¼ „ |
| Total | 128¼ „ | Total | 106¾ „ |

giving an increase for irrigation of—

| | |
|---|---|
| Clean cotton | 7 seers, |
| Seed | 14½ „ |
| Total | 21½ „ |

*Jumboosur Light Soil.*

| *Irrigated.* | | *Unirrigated.* | |
|---|---|---|---|
| Clean cotton | 63 seers, | Clean cotton | 57 seers, |
| Seed | 134 „ | Seed | 134 „ |
| Total | 197 „ | Total | 191 „ |

giving an increase for irrigation of clean cotton 6 seers, unless therefore there should be a marked improvement in the staple of the irrigated cotton, to ascertain which I have sent you, by banghy, samples of each sort, the experiment must I fear be considered a failure."

18. On submitting to Government the Collector's letter, the Revenue Commissioner, Northern Division, suggested that the samples sent by Mr. Tucker be submitted to test by the Chamber of Commerce of Bombay, who were to be requested to report results.

19. Copy of the letter from the Collector of Broach was forwarded to the Chamber of Commerce, who were requested to favor Government with their opinion on the samples of cotton therein referred to, which were also transmitted to them.

Govt. Letter No. 2760, dated 15th July, 1859.

20. Mr. A. D. Robertson, Acting-Collector of Surat, stated in a letter addressed by him to the Revenue Commissioner, Northern Division, under date the 18th July, 1859. No. 591, that his predecessor, Mr. Inverarity, had caused experiments to be made in both the black and Gorat soil, and Mr. Robertson detailed the result in the following terms:—

Bheestan Village Black soil.

"In this village the yield of cotton from irrigated land in half a beegah, was one maund and 37¾ seers, and that of unirrigated cotton in the same extent of land was two maunds and 9¼ seers.

Though the quantity produced from irrigated land is less than that produced from unirrigated land, the former is better in quality, it being stronger and firmer in fibre than the latter, which is comparatively weak.

"The reason assigned for less being produced in irrigated land, is that irrigation is not congenial to cotton plants in black soil.

"Ultham Village. Gorat soil."

"The yield of cotton from irrigated land in half a beegah was 2¼ maunds, and that of unirrigated cotton in the same extent of land was 1¼ maunds. Here the cotton produced from unirrigated land, though less in quantity, is better in quality than that produced by irrigation. It is supposed that in Gorat soil by irrigation the yield is heavier than it is where irrigation is not had recourse to, but the cotton produced is not good in quality."

Mr. Robertson forwarded to the Revenue-Commissioner, Northern Division, a small quantity of cotton produced in the irrigated and unirrigated lands in both the villages.

21. In submitting to Government Mr. Robertson's letter, the Revenue Commissioner, Northern Division, stated in his memorandum, No. 1388, dated the 27th July, 1859, that the Chamber of Commerce would, it was presumed, be referred to, as to the quality of the samples submitted by Mr. Robertson, and that the Collector would be requested to retain the cotton produced from the experiments till the receipt of instructions from Government as to its disposal.

22. A copy of the memorandum from the Revenue Commissioner, Northern Division, and of its accompaniment from Mr. Robertson, was on the 4th August, 1859, forwarded to the Chamber of Commerce, who were requested to favor Government with their opinion on the samples of Surat cotton sent by Mr. Robertson.

Govt. letter No. 3058, dated 4th August, 1859.

23. In reply to the reference made to the Chamber of Commerce in the Government letters, dated the 15th July and 4th August, 1859, they stated in their Secretary's letter, No. 93, of 18th September, 1859:—

"The quality of the cotton does not appear to be materially affected, but if any thing that from the irrigated black soil appears rather weaker than the unirrigated, and the reverse to be the case with that grown in light soil; as therefore the expense must be considerable, and the increased outturn unimportant, the Committee are of opinion that the question of irrigation in the districts* alluded to may be regarded as satisfactorily disposed of.

* Surat and Broach.

"It may be stated as a general principle, that when once the plant has attained its full growth, and has come into bloom, the less water it receives the better, as the effect of watering at such a period is usually to cause the bolls to drop off, and the plant has again to put forth new fruit-bearing branches, the effect therefore is to delay without materially affecting the ultimate outturn of the crop."

24. Copy of the above letter* was forwarded to the Revenue Commissioner, Northern Division; and the Manchester Cotton Supply Association† were furnished with copy of the correspondence on this subject for their information.

* Government Letter. No. 3649, dated 15th September, 1859.

† Ditto No 3650. dated ditto.

25. In the Belgaum Collectorate, the Collector reports that the experiment was confided to his 1st Assistant, "who reports the result to be, that cotton cannot be grown profitably in these districts on red soil, and that in black soil irrigation is positively injurious to the crop."

26. Mr. Seton-Karr states:—

"2. The actual result of his experiment in figures is as follows:—

*Half Beegah Red Soil.*

| | *Yield.* | *Value* | | | *Expense of Cultivating.* | | |
|---|---|---|---|---|---|---|---|
| | | Rs. | As | P. | Rs. | As. | P. |
| Irrigated, | 1 md. 44 srs., | 1 | 4 | 5 | 10 | 5 | 6 |
| Unirrigated, | .. .. | .. | | .. | 10 | 0 | 0 |

*Half Beegah Black Soil.*

| | *Yield.* | *Value.* | | | *Expense of Cultivating.* | | |
|---|---|---|---|---|---|---|---|
| | | Rs. | As. | P. | Rs. | As. | P. |
| Irrigated, | 6 mds. 5 srs., | 10 | 12 | 6 | 5 | 15 | 0 |
| Unirrigated, | 10 ,, 4 ,, | | | | | | |

27. In submitting the Collector's letter to Government,* the Revenue Commissioner, Southern Division, observes:—

* Memo. No. 1771 Dated 30th Aug., 1859.

"2. As regards the Belgaum Collectorate, the result is stated to be a failure with respect both to red and black soils. The samples of cotton produced will be sent when received."*

* Since submitted, and sent to the Chamber of Commerce.

28. Paras. 1 and 2 of the Collector's letter, and para: 2 of Revenue Commissioner's endorsement, were forwarded to the Chamber of Commerce, with the Government letter No. 3651, dated 15th September, 1859.

29. In para. 13 of his Garden and Forest Reports for 1858-59, Dr. Gibson stated :—

"13. Cotton watered and unwatered was tried as an experiment in obedience to the orders of Government last season.

"The produce, as is usual with cotton grown in this part of the country, short in staple, and all the pods more or less diseased. Difference in produce between watered and unwatered not more than four lbs. Total quantity sown was ¾ of an acre, and this is soil which, if situated in Guzerat, would have been called cotton khanum soil, of quality No. 2."

30. Copy of this para. was furnished to the Chamber of Commerce with the Government letter, No. 3204, dated 15th August, 1859.

31. No report has yet been received from the Collector of Dharwa, 26th September, 1859.

True Copy,

(Signed,) B. H. ELLIS,

*Acting-Secretary to Government.*

---

*On the mischievous increase of a gigantic species of Solanum, on the N. E. Frontier of Bengal, more especially in the Tea Districts of Assam : By Capt.* W. H. LOWTHER.

The plant, of which I send you the accompanying specimen [*Solanum torvum Swartz ; S. stramonifolium,* Roxb.], fully promises to become one of the most stubborn and formidable antagonists with which Indian agriculture will ever have to contend. The "dragon's teeth" have been as suddenly as mysteriously sown, on the path of the husbandman, and his old heritage of sweat and toil increased tenfold.

This gigantic *Solanum,* as far as I can ascertain, is of spontaneous origin, and only forced itself on human notice some ten or a dozen years ago, in Upper Assam, where its

arboreous proportions, rapid growth, hydra-like reproductiveness, and armed impenetrability, have all earned for the unwelcome intruder an evil repute, as imperishable as its own peculiar qualities. There are many idle and unfounded tales of the ingenious native inhabitants, bent on making the discovery of its origin, but all are equally plausible, and without foundation. In one district they tell me this vegetable pest "arrived *with some tea seed from China,*" in another that Mr. ——— of tea discovery fame, "*carried the seed with him in his pocket, and sowed it in places, saying he had found a new species of Tomato*;" these, and many similarly vague chronicles on the subject, I gathered from every savage or villager I interrogated during my enquiries, and from Europeans I elicited nothing further than the indubitable facts of a recent and sudden invasion. Here we have a formidable weed attaining the height and branched dimensions of a tree in two years, propagating itself far and wide over miles and miles of open land by a multiplicity of tough rootlets *below* the surface of the soil, and a countless crop of berries above, and thus rapidly becoming a miniature forest, beset with horned thorns, and its evergreen moisture of rankness, defying fire, furnishing too, a cool lair and lurking place to every winged and four-footed thing with a greed for its ripened fruits! Nauseous as these may be to the *human* palate, they are devoured at a wholesale rate by the elephant, buffalo, deer, wild hog, jackall, monkey, peacock, jungle fowl, mainah, and crow, and the seeds always pass undigested, and undeteriorated.

It may, therefore, be readily imagined at how dangerous a pace a fair province is being overwhelmed, and, what is even worse, there is no rational remedy. To hope patiently for its spontaneous extinction after the same fashion as its mysterious development, seems to be after all, the only resource! The Assamese name of "*Hathee-Bekiree*" is now the general and accepted one for this monstrous pest all the way from

the foot of the Mismee Mountains to Gowalparah, not that it is restricted, I regret to say, to that large *locale,* for it has recently descended to the vicinity of Calcutta! I gathered my first specimen in a neglected garden at Barrackpore in 1856, and then noticed more than half a dozen *promising* plants; they were novelties to me at the time, and as I was studying *Solanaceæ* particularly I felt pleased: since which period I have observed it tolerably ubiquitous, even to the vicinity of Raigunj in Rungpoor, where there are many heavy patches by the road-side, and sufficient as a *nursery* to clothe a kingdom in weeds. As far as my own experience goes in eradication, I can only say that the *Solanum* was always triumphant. The military outpost of Saikwah on the Burrampooter was deserted chiefly, from its being overwhelmed by this jungle, and which no outlay could diminish, or keep in check, and now at Suddyah, a post only a few miles off, but on the opposite bank, the same state of things seems imminent, in spite of clearing and the encouragement to cultivation. Already 500 Rupees have been expended by Government, in digging out the *Hathee Bekiree,* and burning it root and branch, but from all the reasons above assigned, without the smallest effect; indeed digging and clearing land seems to exercise the greater benefit on the hidden occupant, for loosening the soil, and thereby scattering the dormant seeds and rootlets, seems to be just the very process for raising a future forest, and you will observe the heaviest jungles on recently deserted fields. In tea plantations, this insidious plague is kept under by the perpetual hoeings and diggings, and ploughings necessary to that peculiar branch of tillage, where a broken soil is indispensable, but for waste lands and surface crops, not yielding any thing very remunerative, such frequent cleaning would be neither possible or profitable,—besides the fertility of the soil is rapidly consumed by successive occupation, and hence after a year's returns the ryot is usually content to shift

his exertions, and leave his late plots to the above described enemy, who with rapid strides soon declares sole possession. Of all the mischievous propagators, those ever present and ready tormentors, the crows, seem the very worst,—THEIR droppings appeared to consist of little more than a crude mass of these hard, horny *Solanum* seeds, and not a box, or a pot, or a border of newly sown rarities, but was duly contaminated by the villanous introduction; *they* are the most active *disseminators* of the obnoxious stranger undoubtedly.

The falling in of the banks of the Upper Burrampooter, is also another prolific source of transmission, and, to *my* thinking, the *original* and *only* one. It is not unreasonable to suppose that one of the three great mountain rivers washed away a dormant strata of imbedded seeds, or even *rootlets*, during its annual career of violence, and thus launched into undesirable proximity the unwelcome subject of the present paper.

---

## *Notes regarding two species of silk-yielding worms found in the vicinity of Pondicherry: By Monsieur* PEROTTET.

I received, in due course, the letter you did me the honor to address to me, asking for information regarding the *Saturnia Mylitta*, and other species of these parts, of which the larvæ are spinners, and form silk-producing cocoons. If I have delayed replying before, it is to be attributed to circumstances beyond my control.

I have indeed devoted my attention for some time to the rearing of the two spinning larvæ that are found in a wild state in our neighbourhood, feeding on the leaves of sundry trees. One of these *larvæ* belongs to *Bombyx Mylitta*, or *Saturnia Mylitta* of modern entomologists, and the second to another genus, also of moths, the name of which is unknown to me, seeing that I am not an entomologist. The larva of this latter species feeds exclusively on the leaves of

the *Odina Wodier* of Roxb., the *siyal* of the Bengalees. I have never been able to induce it to eat any thing else. The cocoon, though it does not appear to be stout *(etoffé)* is so in reality, and the silk it yields is strong, wiry, and brilliant; but it cannot be reeled, that is, the cocoon does not yield its thread as in the case of the *Saturnia Mylitta*, but must be reduced to silken tow, which can be spun into thread with great facility by means of an ordinary spinning wheel. The materials woven therewith are stout and durable. This silk can be dyed exceedingly well any color, as proved twice during my visit to Paris in 1854. The tree on the leaves of which the worm feeds is one of the most common, hard-lived and easy to rear that I know. It is found every where in these parts. Whatever may be said to the contrary, there must be an advantage derivable from the rearing of this insect on a large scale.

It is very probable that both the tree and the worm that feeds on it are to be found in your own neighbourhood. If not, I shall be happy to send both to you, if you will tell me how.

As to the worm of the *Bombyx Mylitta*, which I am told produces the tusser silk, you must undoubtedly have it, as well as the several trees on which it is generally found. These trees are:—1st, the *Terminalia catappa*; *2nd*, the *Zizygium jambolanum*; *3rd*, the *Zizyphus jujuba*, *Z. nummularia*, and *Z. latifolia*. It is found, but less frequently, on the *Pentaptera coriacea*. The cocoons of this worm found on the *Terminalia catappa* have always seemed to be stoutest and strongest, while those gathered on the *Zizyphi* were the weakest. Fifty cocoons obtained from the former tree, or rather which are fed on its leaves, weighed one French pound. These cocoons are exceedingly rich in silk, they reel by means of an alkali or any other solvent, with great facility, and to the very end. The silk they produce is wiry, elastic, and of singular brilliancy.

In the face of these silken treasures with which the country teems, of these natural productions in such request with all nations, civilized or uncivilized, is it not reasonable to ask how it happens that the English Government, generally so careful of the well-being of the people subject to its authority, have not as yet endeavoured, by every possible means, to ascertain whether the small insects by whom they are produced are not susceptible of being subjected to a regular treatment, that should develop a branch of industry of a positive value, yielding an undoubted return? Especially may this question be asked at a time when the silk cultivation of Europe, and of the east, is threatened with extinction by the epidemic disease (gattine) that attacks and kills the cocoons?

I am fully persuaded, by the experiments I have made in this country, with the spinning worm's mentioned above, that young worms might very easily be domesticated. I have succeeded in inducing the moths of both kinds of these precious insects to breed in a state of captivity, thus to obtain sound and productive eggs. When I have more females than males, or as sometimes females without any males, I had only to pass one end of a thread some two meters in length under the thorax of the females, and to tie the other end, during the night, in the open air, to some shrub or other, to find them full provided with mates the next morning. It is to be remembered that these moths, being night insects, only move about during the night.

The worms have, like those of the *Bombyx Mori*, four moulting periods. The periods between each moult are according to the dryness or heat of the season, its humidity or coolness, from 4 to 6, and 8, and even 9 days. Those of *Saturnia Mylitta* especially observe these periods in their changes, and prepare their cocoons from 40 to 45 days after the hatching of the eggs. I have managed to obtain four generations of these worms in the course of one year, but only in the years of abundant rains, and a continued damp atmosphere.

The worm that feeds on the *Odina Wodier*, also moults four times, but at shorter intervals, equally afford four crops in the year. A singular fact, which I wish to bring to your notice, if you are not already acquainted with it, is that the chrysalis of the fourth generation remains in the cocoon in that state until the tree on which the worm feeds, and which sheds its leaves, is again completely covered with its leaves, and in a condition to maintain the forthcoming generation, or in this country from the end of December to the middle of July. This fact should elicit our admiration of the works of the great Creator, and for that Divine wisdom by which every thing in this world, which contains so many ungrateful beings, so many individuals that neither know how to govern themselves, nor even how to prolong their existence during the years allotted for our lives, is organized for the best.

I have despatched to France living cocoons of both these new kinds of spinning worms. Several generations of those of *Saturnia Mylitta* have been reared there, being fed on the leaves of the common oak, that were greedily eaten by them.

The cocoons obtained from them were good, well made and stout, but unfortunately towards the end of a latent generation, the worms were attacked by the prevailing disease (*gattine*) and all fell a prey to it, without a single one being saved. I renewed my despatches of living cocoons five different times during the first months of the current year, and I also made two despatches of living cocoons of the worm that feeds on the *Odina Wodier*. I am ignorant up to this date of the result, beyond having heard that nearly all the cocoons reached safely, and in good condition, a few only of the insects having pierced their covering by the way. At the conclusion of this letter, the length of which you must excuse, I repeat my conviction that on enquiry you will find both the species of *Bombyx*, with their worms, which I have now indicated to you.

## *Abstract of Returns regarding the cultivation of the "Imphee" plant of South Africa, in Bengal and Behar.*

*(Communicated by the Board of Revenue.)*

### Moorshedabad.

Collector's Letters Nos. 120 and 145, dated respectively the 30th July, and 19th August, 1859. Mr. W. M. Beaufort, Officiating-Collector.

The seeds were sown, it appears, in the commencement of May, in the subscription garden of the station, by Mr. Betts. The stalks rose to about seven feet in height, and the seeds were gathered in August, and forwarded to the Board by the Collector. Mr. Betts* was of opinion that sugar could not be extracted from the trees.

* Honorary Secretary of the Subscription Garden.

### Backergunge.

Collector's letter No. 64, dated 6th September, 1859. Mr. C. Limond, Officiating-Collector.

The seed was sown in the month of April, after a heavy shower of rain, and all that had not been previously destroyed by worms and ants germinated in a very short time. The trees grew rapidly after repeated showers, and attained the height of six feet in three months, when the flowers began to appear, and the seed formed and opened in two months. The parties who tried the experiment, declared that the "Imphee" is well adapted for the climate of the District, but it was doubted whether the seed had been sown at the proper time. One individual obtained a pound of juice from the canes, and having boiled it to a consistency, obtained about two ounces of brown sugar. The Collector, Mr. Limond, is of opinion that the plants will yield more sugar if the experiment be tried "on a proper and more extensive scale, and at a period of the year when the saccharine matter will become stronger, by attaining greater maturity, when freed from the moistened atmosphere and exposed to the 'solar' rays of the summer sun."

In a subsequent letter (No. 117, dated 6th October,) Mr. Tucker, Officiating-Collector, said that about forty or fifty plants only had come to maturity. He added "those who have seen the plant are inclined to think that the people of the District will most willingly undertake the cultivation of the "Imphee;" but he thought that unless the seeds were distributed to people in different parts of the country, this point could not be pronounced on with certainty.

CHUMPARUN.

Mr. H. H. Robinson, Officiating-Collector, Letter No. 355, dated 5th October.

Seed was sown in July, and only one plant came up at the time of report, it was six and a half feet high, and apparently healthy. The seeds were mostly worm-eaten, and Mr. Robinson was sowing all what he had at the time of his report. He thought that if the "Imphee" proved equal to sugar-cane,* the ryots would be willing to cultivate it. Mr. Robertson's gardener insisted that the "Imphee" is an indifferent kind of *Janeera*.

* Sugar cane is cultivated extensively in the North-West of Chumparun.

MIDNAPORE.

Letter No. 275, dated 6th October, 1859, Mr. A. Elliot, Officiating-Collector.

All the six varieties of the seed were sown in April in the Jail garden, and the plants came to maturity in August, but there was no difference apparent either in the juice or in the plants. Each cane yielded about half a tumbler of juice, which was converted readily, by boiling, into treacle, which the Jail darogah pronounced to be as good as that produced from the sugar-cane.

Owing, however, to the smallness of the quantity experimented upon, and the dampness of the weather at the time, the treacle could not be converted into sugar.

Mr. Elliot adverted to the fact of applications having been made for the seed by two or three Native zemindars. The *mali* of the garden declared the seed and crop to

be the same as that grown in the district, but the Darogah ascertained this to be a mistake.

RAJSHYE.

Collector's letter, No. 540, dated 8th October. Mr. F. A. Lushington, Collector.

The Collector sowed in April some seeds in his own garden, and raised about two cottahs of very fine plants. The trees blossomed about the end of June, and in July upwards of a seer of seed was gathered. They grew to the height of eight or nine feet, and the stalks were about three and half inches in circumference.

The seeds sown elsewhere in July grew up to the height of three or four feet, and the trees withered gradually, and died without blossoming, apparently from excess of rain. Mr. Lushington was of opinion that April was the proper month to sow, and that the plant should be sown, "so as to be at least eighteen inches above the ground before the heavy rains set in, after which the plant would not be injured." The Collector stated his intention to ascertain during his tour whether the people would be willing or not to cultivate the plant.

The Collector reported that on the stalk of the plant being cut, a copious supply of saccharine matter oozed out.

BEERBHOOM.

Letter No. 489, dated 11th October. Mr. H A. R Alexander, Collector.

The Collector made over the seeds to Mr. Erskine for cultivation, who reported as follows:—

"Towards the close of May, the six packets of 'Imphee' seed were sown in well manured soil, in drills two feet apart, and at distances of six inches. The seed did not germinate freely, owing to its being somewhat damaged; about 180 plants were however obtained, their average height being from 10 to 12 feet. It was necessary to support them; without this precaution, the gale of the 26th of July would have prostrated the whole."

"About the beginning of July, the plants began to flower, and a fortnight or so later, the seeds began to form. At this stage, with the exception of a few plants reserved for seed, the heads were broken off, to give stamina to the stalks, and assist the formation of the saccharine matter."

"Three and a half months after the seed was sown, that is, towards the middle of September, a discoloration and drying up of the stalks were observable, a proof the plants, had attained maturity; they were then cut, and a '*churkee*,' or common hand-mill was employed in crushing the stalks. The juice expressed was sweet, but, in boiling, no grain was produced in the *goor*, a result which the local native farmers attribute to the very unfavorable weather for its manufacture, it being at the time exceedingly close and cloudy."

"The general impression was, that the 'Imphee' would not attain maturity till after the expiration of four and a half months, the experiment has proved that the period allowed was too protracted, and that in three and a half months the stalks were ready for the mill. Had the seeds been sown a month later, the cane would have been crushed towards the commencement of the cold season, and the probability is, that a temperate atmosphere would have naturally assisted the granulation."

From the 130 plants three seers of goor were obtained.

The Collector had not ascertained, at the time of submitting his Report, whether the people of the District were willing or not to cultivate the "Imphee" seeds.

RUNGPORE.

The seeds were made over by the Collector to Mr. Rehling, for the purpose of being sown, but they were worm-eaten, and did not vegetate.

Letter No. 326, dated 13th October. Mr. A. G. Macdonald, Collector.

Mr. Macdonald was of opinion that the seeds had been kept too long, and were sown too late.

With reference to the willingness or otherwise of the

people to sow "Imphee," Mr. M. said "the people of Rungpore are rarely disposed to make experiments untried by their ancestors, and I do not therefore believe that many would be found to further the cultivation of the 'Imphee' at present."

### Baraset.

In this District the "Imphee" seeds were given to several ryots, and sown by them. The seed was however entirely unproductive, being, as the Officiating-Collector supposed, "bad of its kind."

Letter No. 368; dated 14th October. Mr. J. P. H. Ward, Officiating-Collector.

He believed that if good seed were distributed, the ryots could be prevailed on to sow, notwithstanding the disheartening effect of the present failure.

### Dacca.

Here the seeds were sown by the Jailor on the 30th April, immediately after a heavy shower of rain, and were daily watered by hand for 15 days. On the 2nd May some more seeds were sown, which did not require watering, as there were slight showers of rain occasionally. Of the seeds sown about ninety per cent. germinated, the latter crop bore a much larger quantity of seed. Altogether thirty seers of seeds were gathered.

Letter No. 323, dated 14th Oct. A. E. Russell, Esq., Collector.

The saccharine qualities of the plant did not "answer the description" given in the pamphlet received from Dr. Balfour, and the Jailor says the plant "would never do as a substitute for sugar-cane." The plant appeared to the Collector, and to several up-country natives who saw it, to be identical with the "Janeerah," which is grown in large quantities in Purneah and throughout Behar. The stalk is considered to be excellent food for cattle and elephants.

Several planters and ryots took quantities of the seed produced, in order to cultivate it in their neighbourhood.

SARUN.

Letter No. 111 of 15th October. Mr. H. C. Richardson, Officiating-Collector.

Regarding some seed sown in Mr. K. Macleod's garden, the Collector quoted as follows from the report of Mr. Deputy-Collector Macleod:—

"It germinated quickly, the plant, however healthy and fruitful, does not possess any advantages greater than the '*Masoreea Janera*' of the country, very largely cultivated for the use of the poorer classes of people, who eat it either in a parched state, or worked up in unleavened cakes as bread."

"The stalk, although possessing a good deal of saccharine matter, is generally given to horned cattle. The natives have never crushed it for the produce of sugar."

"The samples received were in quantity too small, and too much destroyed with weevil, to be distributed amongst the native cultivators. What I had sown in my garden germinated partially, and what came up was feeble in growth, and yielded no produce whatever, whereas the country seed called '*Masoreea Janera*' yielded me a very luxuriant crop. The country seed is of two kinds, one white and the other black, distinguished as 'Rukasseea.'"

NUDDEA.

Memo. No. 119, dated 17th October. Mr. E. E. Woodcock, Collector.

Mr. Belli, the late Collector, had all six specimens sown in his own garden between the 5th and 12th of May, and, on leaving the district, left a memorandum, which contains the following information:—

"Nos. 1 and 4 were full of weevils, but the seed nevertheless sprang up like the others, in the course of a few days, though the yield has been less abundant, and the produce looks sickly."

"The soil in which the different specimens have been sown is precisely similar, and all have had equal advantages

of aspect, having been sown as near as they could be to each other, without risking the chance of confusing them."

"Nos. 1, 2, and 6, were after a time transplanted, and are now thriving well; the produce from them will doubtless be good, but No. 5 is evidently the royal specimen of the batch, it having been planted last but one, and having outstripped the others by several feet. It must now at least be ten feet high, with heads heavy with grain, which will ripen in the course of a week or fortnight."

* 25th July, date of Memo.

"The 'Imphee' seed, from the few enquiries which I have made, seems to be known in Bengal, but to be rarely used; whilst in Cuttack, if credit is to be placed on the revelations of an Oorya *mali*, who was in my service, and watched the growing plant, it is much cultivated. The inhabitants of that part of the country call it '*Deodhan*,' and use it mixed with sugar, and slightly parched, as '*Jolpan*,' or '*China murky*,' which words need no explanation to Indian functionaries. The thick juicy stems of the plant make excellent fuel after a few days drying in a tropical sun."

In forwarding the above Memo. on the 17th October, Mr. Woodcock, the then Collector, stated that the plants were all dead, the best of them having been prostrated by the great storm of the 28th July, after which they did not revive.

### Behar.

Letter No. 701, dated 18th October, 1859. D. Cunliffe, Esq., Collector.

The seed was made over to two individuals in the district, the portion given to the head-clerk of the Collector's office vegetated well, and came to perfection. The Collector says that the "flavour" of the juice was sweet, indicating the presence of saccharine matter in the stalk, and he intended to make an attempt to extract sugar from it.

The portion made over to a native landed proprietor partially failed, and only 20 of the seed vegetated, the trees being stunted, and appearing to the Collector useless.

The Collector was of opinion that the quantity forwarded for distribution was not sufficient to ensure a fair trial.

BANCOORAH.

Letter No. 219, of 20th October. J. M. Lowis, Esq., Officiating-Collector.

Here the experiment was unsuccessful. Some seeds were sown in the Jail garden, but on the garden being given up, the plants were lost sight of, and consequently trampled down and destroyed.

When Magistrate of Midnapore, Mr. Lowis had an opportunity of seeing the "Imphee" seed cultivated in the jail garden of that district, and he is of opinion, from experiments made there, "that 'Imphee' would be peculiarly well adapted for high lying poor soil, such as prevails in Bancoorah."

MYMENSINGH.

Letter No. 301, dated 24th October. Mr. J. D. Ward, Officiating-Collector.

Mr. Campbell, late Collector of the district, sowed the seed, and the result was satisfactory. The plants were strong, and appeared to have saccharine matter in them.

Mr. Ward is of opinion that the district of Mymensingh is physically favourable to the cultivation of "Imphee" but as the ryots are proverbially apathetic, and averse to innovation, he recommends its introduction by very gradual means.

TIRHOOT.

Letter No. 357, dated 3rd November. Mr. H. L. Dampier, Officiating-Collector.

The seeds received in boxes Nos. 1, 3, and 4, were worm-eaten, and could not therefore be sown. Those received in boxes Nos. 2, 5, and 6, were sown, but grew very unsatisfactorily; heads formed, but they all died off before the grain came to "any thing like perfection."

Mr. H. L. Dampier thought it probable that each of the varieties of Imphee and Sorgho would be found growing in

abundance in the Patna District, and partially in Tirhoot, under the names of "Ruksa Janeera," "Doodhya Janeera," "Musoorea Janeera."

PATNA.

The Collector reports that the zemindars in his district are not willing to further the cultivation of Imphee, as its grain appears to be the same as "Jowar Khoord," which is largely cultivated in Patna.

Letter No. 179, dated 19th November, 1859. A. Hope, Esq., Collector.

Mr. Hope forwarded to the Board a sample of the plant raised from the Imphee seed by the Zemindars.

SHAHABAD.

Letter No 1061, dated 14th October. Mr. A. A. Swinton, Collector.

The Collector reports that he cannot ascertain in what manner the "Imphee" seed was disposed of.

PURNEAH.

In this district the seeds were made over to three gentlemen for cultivation, Messrs Gatfield, Earle, and de Courcy. The latter two gentlemen did not send in their report up to the date of the Collector's letter, the plants not having reached maturity. Mr. Gatfield (since dead) informed the Collector that out of two boxes of seeds supplied to him only eight seeds germinated. The Collector did not hear any thing further regarding these eight trees.

Letter No. 400, dated 18th October. R. Alexander, Esq., Collector.

JESSORE.

Letter No. 182, dated 7th December. Mr. E. W. Molony, Officiating-Collector.

The seed was distributed to several gentlemen, one of whom only, Mr. Seton-Karr, reported the result of its cultivation.

The seeds were planted in June, and only five plants came to maturity, reaching the height of from six to eight feet, and giving a crop of seed, which was carefully gathered for the purpose of making farther trial.

Mr. Seton-Karr says "there is an indigenous plant very similar to this 'Imphee' termed *didana*, not uncommon in this part of Bengal. The seeds are pounded, and made into the preparation sold in the shops as '*moorkhi*,' and the leaves and trunk serve as forage for cattle. A specimen of this plant is now before me, and much resembles the plants reared from the seeds of 'Imphee.'"

Mr. Seton-Karr is of opinion that the result of the experiment, as far as tried by him, does not augur well for the extensive introduction of the Imphee into that part of the country. He says "a plant similar to it exists, and there is nothing in the superior productiveness or material of the new plant to make it worth the cultivator's while to grow it largely."

Mr. Molony is also of opinion that "the cultivation is not likely to be popular with the natives in these parts, who are particularly averse to the introduction of new articles of produce."

BOGRAH.

Letter No. 67, dated 16th November. Mr. H. Bell, Officiating-Collector.

The seed was not sown here. Mr. Bell however promised to distribute it to some of the gentlemen of the District.

MALDAH.

Letter No. 296, dated 10th Oct. Syed Abdool Musjeed, Uncovenanted Deputy-Collector in charge.

The Deputy-Collector reported that it appears from a memo. left by his predecessor Mr. Russell, that the seeds were mostly destroyed by weevils. He intimated having referred to Mr. Russell on the subject.

BURDWAN.

Letter No. 570, dated 20th September. Mr. H. B. Lawford, Officiating-Collector.

Reported having sown the seed, but asked for a further supply, as the quantity received by him was for the most part worm-eaten.

*Memorandum on the Experimental Cotton Garden at Rangoon: By Dr. D. Brandis, Superintendent of Forests, Pegu and Tenasserim.*

*(Communicated by the Bengal Chamber of Commerce.)*

Order for establishment of experimental cotton cultivation received in August, 1857.

The first directions for commencing experimental cultivation of foreign cotton were conveyed in letter No. 3040, dated 24th July, 1857, from Mr. Secretary Edmonstone to Commissioner of Pegu, communicated to the Superintendent of Forests on the 18th August, 1857.

Extract from letter No. 3040, dated 24th July, 1857, from Mr. Secretary Edmonstone to Commissioner of Pegu:— "The matter may properly be put in Dr. Brandis' hands; no heavy expence must be incurred in carrying out the proposal."

2. Soon after, a quantity of Egyptian seed was received from the Commissioner's office, and cultivated on a piece of ground cleared for the purpose at the Government timber depot. The result of this cultivation has been reported in Letter No. 41 D, dated the 19th July, 1859. The locality was unfavorable, and hence the out-turn (60℔s. of cleaned cotton per acre) unsatisfactory.

3. During 1859, large quantities of different kinds of seed were received, and it became necessary to look out for a more suitable locality, where to establish a regular system of experimental cultivation.

Ground selected.

4. The ground selected for this purpose was sanctioned by the Commissioner on the 23rd September, 1859. The area first selected was 29·9· acres, but it was afterwards reduced to 25.3· acres, by the transfer of a portion to the Magistrate, to serve as a Burmese burial-ground. A portion of the ground was cleared, levelled, and prepared for the reception of cotton during the dry season of 1858-59, but the seed, when sown in June, 1859, was found to have become unfit for germination. There remained only the seed obtained from the cultivation of the Egyptian cotton

in 1857-58, and for the cultivation of other kinds, in private gardens; but a further supply has been sent for, and is shortly expected from the Agricultural and Horticultural Society, Calcutta.

Amount expended on preparation of Ground.

5. The amount expended up to the 31st July last, on the preliminary works which were absolutely necessary for bringing a portion of the ground (about 6 acres) into a fit state for the object in view, has been as follows:—

| | Boundary survey; Hedge, &c. | | | Preparation of Cotton Fields. | | | Miscellaneous Cultivation. | | | Contingencies, including houses, superintendence, &c. &c. | | | Clearing jungle; levelling ground, &c. | | | Roads, tanks, and wells. | | | Total. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | Rs. | A. | P. |
| 1858-59. | 33 | 8 | 0 | 393 | 0 | 0 | 58 | 0 | 0 | 129 | 5 | 4 | 580 | 12 | 0 | 0 | 0 | 0 | 1194 | 9 | 4 |
| May, 1859. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 296 | 0 | 0 | 296 | 0 | 0 |
| June ,, | 0 | 0 | 0 | 73 | 8 | 0 | 0 | 0 | 0 | 19 | 6 | 0 | 0 | 0 | 0 | 74 | 0 | 0 | 166 | 14 | 0 |
| July ,, | 135 | 0 | 0 | 48 | 0 | 0 | 86 | 8 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 26 | 8 | 0 | 309 | 0 | 0 |
| Total, | 168 | 8 | 0 | 514 | 8 | 0 | 144 | 8 | 0 | 161 | 11 | 4 | 580 | 12 | 0 | 396 | 8 | 0 | 1966 | 7 | 4 |

This includes the planting of a bamboo fence round the whole ground; the rough laying out of the greater portion of the roads; the clearing and levelling and preparing of five acres for cultivation; the planting out of teak and other trees intended to form avenues along the roads, and the establishment of a nursery for teak and other kinds of trees.

The advantage of experimental cotton cultivation questionable. High price of cotton in Pegu.

6. Just doubts have been entertained whether the introduction of foreign cotton into Pegu is a matter of such importance as to justify an outlay of public money. At present raw cotton is exported from Pegu to a few neighbouring ports only, and the quantity

is not considerable. As a rule the price of cotton in Pegu is so high, that an exportation to Europe would not be profitable. According to Major Allan's statement, the price at Prome varied from 5 to 10 Rupees per 100 viss of uncleaned cotton under the Burmese rule, and from 9 to 12 Rupees in 1857, (January). At Rangoon, the price at present is 15 Rs. per 100 viss, and in the Tharawaddie district it is similar, though it has been there as low as from 5 to 8 Rupees.

We may therefore take 5 and 15 Rupees as the limits of the price of the uncleaned article on the banks of the Irrawaddy, whence it can be shipped in boats. Hence the price of the cleaned article would appear to vary as follows:—

| Price of 100 viss uncleaned in Rupees. | | | Price per ℔ of clean in Pence. |
|---|---|---|---|
| 5 | 0 | 0 | $2\frac{1}{5}$ |
| 10 | 0 | 0 | $3\frac{1}{3}$ |
| 15 | 0 | 0 | $4\frac{3}{5}$ |

This agrees with the valuation of the article exported from Rangoon as given in the Table 1; but it appears from these data, and the figures of column 7, taken from Mr. J. F. Watson, on the growth of cotton in India, that only when the price of 100 ℔s of uncleaned cotton is below 10 Rupees, the export of it to Europe may be profitable, and even then on only the supposition that Pegu and Surat cotton will fetch the same price, and that the expense of transit from Rangoon or Prome to Liverpool does not exceed one penny per ℔, which is the average amount assumed from Indian ports.

Amount of cotton from Pegu.

7. The amount hitherto exported from Rangoon is seen from Statement 1, kindly communicated to me by Mr. Edwards, Collector of Customs. It has been only for local consumption in the neighbouring ports, and, as might be expected, the amount exported in no way depends on the price of the European market, indeed the largest export took place in 1859, after

three years of very low prices in England. It is however probable that the export of cotton from the hills west of the Irrawaddy, across the Arracan Yoneah, and that, in the Tharrawaddie district viâ Henzadah, down the Irrawaddy river in country boats to Chittagong and Dacca, (without touching at Rangoon,) is far more considerable than the export viâ Rangoon.

Cotton an important article of inland barter trade.

8. But cotton though not at present of importance as an article of export, is necessarily an article of considerable barter trade within the province. A large portion of the inhabitants of the hills do not as a rule produce a sufficient quantity of paddy for their own consumption throughout the year. It depends on the amount of rain before the burning of the Toungyas at the time of sowing, and during the growth of paddy, whether larger or smaller quantity of paddy must be bought from the plains. In some parts silk is the staple which is bartered for paddy; in others it is sesamum oil, and in the mountains between the Salween and Sitang it is betenut, betel leaves, indigo, and tobacco.

An increase of cotton cultivation may possibly be produced by a rise in the price of paddy.

9. Cotton however forms by far the most generally used article of barter for paddy within the province of Pegu. Now, unless the price of the cotton and paddy rise at the same time, and in the same proportion, scarcity of paddy, whether in the hills or in the plains, will compel the inhabitants of the hills to increase the cultivation of their respective articles of barter. Thus the present high price of rice may possibly have the effect of increasing the production of cotton, and this may cause an increased exportation of the article.

The increase in the importation of twist may have the same effect.

10. Another circumstance which would appear to justify the expectation of an increased export of cotton, is the steady increase that has taken place within the last four years in the import of cotton thread and twist, and a corresponding

decrease in the import of manufactured cotton goods. The increased use of English cotton thread in the place of home grown cotton, is a fact which may be observed in almost every village of Pegu that is accessible to boats and carts. It must have the effect of either decreasing the cultivation of cotton, or of increasing the consumption of cotton goods, or of creating an export of the raw article.

11. Hence it may not be unreasonable to view a future export of raw cotton from British Burmah as not altogether impossible, although perhaps not very near at hand, and it remains to be considered whether an increase in quantity, or an improvement in quality of the produce, may be expected from the introduction of foreign seed.

Can the production of cotton be increased by the introduction of foreign seed?

The cotton cultivated in Burmah is a variety of *Gossypium herbaceum;* the shrub is small, with small hairy leaves. The cotton is short stapled, but very fine. With the exception of a limited quantity in gardens, it is at present cultivated only on Toungyas, and on clearings on the river side.

Some kinds of foreign seeds produce stronger plants more likely to yield several harvests in succession.

On Toungyas the seed is thrown out after the paddy has been sown (in June); it flowers about the time that paddy is reaped, and the cotton is gathered in February and March. A small quantity is gathered from the same field the second year, but rarely any on the third. The plant, it is true, lives more than one year, but, being habitually small, it is easily choked by weeds. I know that Toungyas cultivators in different parts of the country would consider it a great advantage to obtain seed from which they could rear more than one crop. The plants however that shall yield more than one harvest, ought to attain a larger size than the variety cultivated at present, so as to keep down the weeds springing up abundantly on every deserted Toungyas. Upland seed would probably answer in this respect, and enable the

cultivators to reap a harvest of cotton from one and the same Toungyas for a succession of years, in a manner similar to the cultivation of plantains carried on by the Kareens and Shans in the Attaran district of the Tenasserim Provinces.

12. Moreover there are extensive tracts in the mountains between the Sitang and Salween rivers, where the inhabitants are desirous of cultivating cotton, but do not succeed with the kind at present grown in Burmah. Major Allen states that the cultivation of cotton does not rise in the Prome district to an elevation exceeding 1200, and this is quite borne out by my observations on the mountains between the Sitang and the Salween rivers. Cotton is grown here and there near the villages of Myetguan valley, on an elevation of 2,000 to 3,000, but the plants only attain a diminutive size, and the quantity of cotton produced is insignificant. In the same locality some plants of cotton from American seed (Upland and Sea Island) were found to thrive very well; the seed had been distributed by Dr. Mason of Toungh̤oo. If the continuation of this attempt should prove successful, vast tracts of the fertile mountain land might become available for cotton cultivation, I allude not only to the tract between Toungboo and the Kareen country, which is comparatively well populated, but to the whole of the mountains to the South, comprising the plateau of the Upper Younzaleen and Salween, a country once densely populated, now in a great measure deserted, but which, under the influence of peace, and wise administration, will undoubtedly soon revert to its former flourishing state.

Some kinds of foreign cotton would be likely to succeed on the mountains, where Burmese cotton does not thrive.

13. The second mode of cultivating cotton is on the river bank. The elephant-grass is cut down before the river overflows; after the floods have left the ground, (in September) the spot is cleared, and the seed is thrown out. On these fields the cotton ripens in March and April.

Foreign seed may perhaps, with advantage, be introduced on localities, near the river bank.

It is not impossible that in such localities also foreign seed might be cultivated with advantage.

Localities fit for permanent paddy cultivation not likely to be extensively used for cotton.

14. It is not likely that, as prices stand at present, localities fit for wet paddy cultivation will, to a considerable extent, be devoted to the cultivation of cotton for export. For if the average yield of an acre in paddy is only put down at 50 baskets, and the average price of 100 baskets @ Rs. 50, the value of the produce will be Rs. 25 per acre.

But the maximum rate at which cotton can at present with advantage be raised for the European market is Rs. 10 per 100 viss. Thus, in order to make cotton cultivation as profitable as that of paddy, one acre ought to yield 250 viss, corresponding to 223℔ of clean cotton, and this is considerably above the average yield in the United States (which is estimated at from 132 to 176℔s of clean cotton.) The less weight is of course, in the case of export, considerably in favour of cotton, the proportion being 223℔ to 2,000℔s per acre.

On Toungyas, the average yield may probably be put down at 25 baskets of paddy per acre, so that a yield of 112℔ of cotton per acre would be sufficient to balance the profits of paddy cultivation.

But the advantage of Toungyas, is that paddy and cotton are sown together, and the advantage of the localities on the river bank, fertilized by inundation, is the little amount of labour there required.

To the high ground therefore, which has hitherto been cultivated only by clearing and burning, and to the river banks, we have principally to look for an increased production of cotton in this country.

An improvement in quality no immediate advantage.

15. With regard to an improvement in the quality of cotton, the misapprehension must be guarded against, that natives would prefer foreign cotton on account of the longer staple or greater strength of its fibre.

Foreign cotton is likely, to a certain degree, to labour under the same disadvantage in Burmah as in Coimbatore. The following is an extract from a letter from the Collector of that district to the Conservator of forests in the Madras Presidency:—

"The cultivation of American cotton in Coimbatore, has decreased, inasmuch as it requires somewhat more labour and expense, and has no steady *demand*, it being suited for the *European but not to the Native Market;* if any European merchant would settle here, and ensure a fixed demand, any quantity of foreign cotton may be grown."

But Burmah has the advantage of numerous creeks and rivers, and this greater facility for export may, provided foreign seed proves productive, induce the cultivator to take to it, not for his own consumption, but for the sake of export.

Main object of an experimental cultivation of cotton.

16. Under these circumstances, although very sanguine expectations regarding its success should not be entertained, it would scarcely be right altogether to discontinue the experimental cultivation of cotton. Its main practical object will be to test different varieties, with regard to the following points:—

1. The time required in this country between sowing and harvest.
2. The yield per acre during the first, second, and third year.
3. The value of the product in the Liverpool Market.

The experimental cultivation in a garden at one place can of course not be expected to give replies to these questions, directly applicable to the different parts of the country, and the different localities where cotton may be cultivated; but, by distributing seed to other parts for trial, the results may gradually be made more complete and practically valuable.

*Statement of Cotton exported during the years* 1853, 1854, 1855, 1856, 1857, 1858, 1859.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
|---|---|---|---|---|---|---|---|
| Years. | Viss. | Value. | Average rate per viss. | Price per ℔ uncleaned in pence. | Price per ℔ cleaned in pence. | Price of twist Cotton in the corresponding years. | Remarks. |
| | | | Rs. As. P. | *d.* *f.* | *d.* *f.* | *d.* | |
| 1853, | 2,430 | 263 0 0 | 0 1 9 | 0 $2\frac{4}{5}$ | 3* $1\frac{8}{10}$ | $3\frac{1}{2}$ | * Data for the calculation of the price of cleaned cotton. |
| 1854, | 6,100 | 925 0 0 | 0 2 5 | 0 $3\frac{9}{10}$ | 4 $1\frac{7}{10}$ | $3\frac{1}{2}$ | |
| 1855, | 1,600 | 195 0 0 | 0 2 0 | 0 $3\frac{1}{5}$ | 3 3 | $3\frac{7}{8}$ | 100 viss 365 ℔s. |
| 1856, | 37,550† | 5,134 0 0 | 0 2 2 | 0 $3\frac{3}{5}$ | 4 $0\frac{4}{10}$ | $4\frac{3}{8}$ | 100 viss uncleaned gives 30 viss cleaned. |
| 1857, | 2,200 | 436 0 0 | 0 3 2 | 1 $1\frac{1}{5}$ | 5 $1\frac{3}{4}$ | $5\frac{3}{8}$ | The cost of cleaning 100 viss (uncleaned) is Rs. 5. |
| 1858, | 8,760 | 1,722 8 0 | 0 3 2 | 1 $1\frac{1}{6}$ | 5 $1\frac{1}{2}$ | $4\frac{3}{4}$ | † This large export was caused by a large import of cotton goods from Ava. |
| 1859, | 750 | 155 0 0 | 0 3 3 | 1 $1\frac{2}{5}$ | 5 $2\frac{1}{2}$ | | |
| Total, | 59,390‡ | 8,830 8 0 | | | | | ‡ It is assumed that the whole of this was uncleaned cotton, though it may be, that a small portion of it was cleaned. |

(True Copy.)

OFFICE OF THE SUPT. OF FORESTS,
PEGU AND TENASSERIM,
RANGOON :
*The 30th of August*, 1859.

H. NELSON DAVIES,
*Personal Assistant to the Commr. of Pegu, and Agent to the Gov.-General.*

(Sd.) D. BRANDIS,
*Supdt. of Forests, Pegu and Tenasserim.*

### *Correspondence regarding Munjeet.*

[In a previous number of the *Journal*, Vol. X, page 151, a short, but interesting, paper from the pen of Mr. H. Cope, of Umritsur, was published on the subject of Munjeet as a dye-stuff; localities where grown, export, &c. These remarks attracted the attention of Dr. Campbell, Superintendent of Darjeeling, who addressed the Society in a communication, dated 1st January, 1859. Dr. Campbell's letter has already appeared in the proceedings for May, 1859, but it is thought desirable to reproduce it, and other brief notes on the same subject, subsequently received from Dr. Gibson, Mr. Cope, and Dr. Cleghorn, in this part of the *Journal*, with the view of bringing the subject matter more prominently to notice.]

In the last published number of the Society's *Journal*, No. 2. Vol. X., Mr. Cope, in his paper on *Munjeet*, states that the root only of the Affghanistan plant is used as a dye. He alludes, I observe, to an article on the same subject in *The Indian Field*, in which it is stated that the stem or stalk of the Nepal plant is the part yielding the dye. From a foot-note attached to the paper, this fact appears to be doubted, and it is there added that it is from the *root* the dye is obtained. Having had abundant means of judging of the Nepal munjeet, I would wish to certify to the fact that the *entire* plant is always dried, and is the munjeet of commerce used by dyesters in that country as well as in Sikkim and Bootan. I have the pleasure to send you a specimen of the munjeet of this place for your own examination and satisfaction, and there is no other article in the Himalaya bearing the name of "munjeet;" of this you may rest assured. The root of Affghanistan may or may not be the same as the "madder" of Europe, but it is not, I believe, the same plant as the Himalayan munjeet. Dr. Thomson can settle this point; but it may be well to

ascertain precisely what is meant in the Bombay export returns by "madder" and "madder root"; whether they are separate names for the same article used heedlessly, or are really different articles, and if so, what? Is "madder" the Himalayan munjeet, and "madder root" the Affghanistan article? Is the Affghanistan article and the madder of Europe the same? Is the root only of the European plant used in dyeing? These questions are all in need of settlement; the last one, with present reference to the supply of madder seed expected by the Society from Avignon, and to be distributed in India. The great *bulk* of the munjeet as presented to the dyester, is no doubt a serious disadvantage, but to reduce its bulk by grinding it into powder, still leaves a great *weight* of material for carriage, so that the great desideratum really is to lessen the bulk and weight without any loss or damage to the coloring matter. To this end the Society may be disposed to contribute by offering a prize. Many years ago, Dr. Irvine, of the Bengal Service, when at this place on account of his health, made some experiments for this purpose on the munjeet, but I never heard the result. His object was to procure the whole coloring matter in the form of cakes like indigo, but how it answered I do not know. A great deal of munjeet is exported from all parts of the southern face of the Himalaya into Thibet, where it is much used in making the purple dye for Lamas' habiliments. As the transport of this bulky article is entirely effected on men's shoulders, and over difficult passes of elevations from 14 to 18,000 feet, the reduction of bulk and weight is quite as much a desideratum for the Thibet trade as for that to Europe, and is therefore doubly interesting and deserving of the Society's consideration. I hope you will endeavour to make it so.

A. Campbell.

In respect to the latter part of Dr. Campbell's communication, the Secretary reminded the Meeting that the

subject of a good and economic mode of preparing munjeet for shipment had more than once engaged the attention of the Society, (see Report of Committee on prizes for articles of raw produce, &c., *Proceedings of the Society, Vol. X. Part 2, page* 99); but the matter had been deferred pending the receipt of a report and information from the Society of Arts. The Secretary further mentioned that on receipt of Dr. Campbell's letter, he had addressed Dr. Gibson, Superintendent Botanic Gardens, Western India, and Mr. Cope, of Umritsur, and he now begged to submit extracts from their replies:—

*Extract of Dr. Gibson's letter, dated 26th February.*—In reply to your letter of 4th instant, with enclosure, I beg to say, that as I mean to visit Bombay next month, I will be able to give you such information as is to be had there regarding the munjeet.

Meantime I may state my impression, *1st*, that the root only is exported, *2nd*, that the madder of Affghanistan is *Rubia cordifolia*. I grew a quantity of it in this garden for years, and have more than once I think sent specimens of the root, such as a basketful at once to Bombay, but, as the subject was taken up by no one, I ceased to cultivate the plant.

I certainly, until I saw Dr. Campbell's letter, doubted the fact of the stem containing any coloring principle, and even yet I suspect some error.

I believe that the madder and madder root, as marked in the Bombay export returns, are identical. By good luck I found this day about 8 or 10 mds. of munjeet of that last dug up by me at the garden here.

I will send you this quantity round to Calcutta, so that you can experiment on it, and let me know the result, and I will feel greatly obliged by your doing so. [This has not reached the Society.]

At Bombay there is now no one who appears to take the least interest in those enquiries which excite so much interest apparently in Calcutta.

*Extract of Mr. Cope's letter, dated* 17*th February.*—I regret I cannot give you any definitive answers to the suggestions of Dr. Campbell about the distinction drawn in the Bombay export returns between madder and madder root. You may remember I drew attention to this point myself in a previous communication. Madder is certainly not the same as the Himalayan munjeet, as distinctly laid down by the letter from Avignon you communicated to me some time ago, in which it was stated that not only were they not the same, but that the colors obtained were different and applied to different purposes. Whether the munjeet of Affghanistan is identical with the madder of Europe remains to be proved. It is certain that what is exported from Sind as munjeet is exported from Bombay as madder, and that the Bombay export is called madder in England. But the matter will be shortly set at rest when the samples my firm has sent to Messrs. King of Avignon reach their destination.

The Secretary likewise submitted the following extract of another letter on the same subject, recently received from Mr. Cope :—

Mr. McLeod has sent me two plants of the munjeet that grows in the Kangra District in all directions. They were languishing at first, but are now throwing out vigorous and healthy branches, and if they flower, as I have small doubt they will, I will do myself the pleasure of sending you samples or rather specimens of sufficient size to enable Dr. Thomson, or any other botanist, to compare them with the Assam and Nepal plants.

At the meeting in the following August, Mr. Cope submitted some Kangra munjeet, and pieces of cloth dyed with it and Affghan munjeet: the following notes dated 12th and 18th July, in reference to them, were also read :—

I have already mentioned to you that a species of Munjeet grows wild and abundantly in the Kangra Hills, but it does not appear to be used for dyeing or commercial

purposes by the indigenous population. It, therefore, becomes a matter of some importance, whether the Kangra plant is applicable to the purposes for which madder and the Himalayan munjeet of Nepal, Assam, &c., is used. I was in hopes that two plants which Mr. D. F. McLeod, Financial Commissioner of the Punjab, was so good as to send me, would have assisted in determining the specific identity of this plant; but I regret to say that, notwithstanding all the care I took of them, they have died. The roots, when taken up, appeared to me to differ in nowise from the Affghan madder, specimens of which sent by me were so much admired.

I now do myself the pleasure of forwarding to your address one seer of munjeet, stem and root, selected from a quantity, which Mr. D. F. McLeod, with his usual readiness to assist in eliciting information in all matters of this kind, was so good as to obtain for me at Kangra, and which I shall be obliged by your submitting to the next meeting of your Society. It labours, in my opinion, under the disadvantages of having been gathered much to early. I consider October the proper month for digging up the root, or even later; but the sample I send may enable you, or some of your members, to determine how far it may be desirable to follow up the subject.

I send by dak banghy this day two specimens of coarse country cotton cloths dyed: No. 1, with Affghan munjeet or madder; No. 2, with the munjeet so obligingly sent by Mr. McLeod from the vicinity of Dhurmsala, in the district of Kangra. You will observe that the latter is inferior in appearance to the former. The inferiority is chiefly owing to the root having been dug much too early in the season, and probably, in the opinion of the dyer, to the root not containing, even when mature, quite so much coloring matter as the Affghan madder. It strikes me, therefore, that it may turn out, as I have already surmised,

that while the Kangra plant may prove the same as that of Nepal, the Affghan root will be found closely allied to, if not identical with, the European madder. I ought to mention that the same process, described below, has been adopted in both cases by the dyer. If my surmise be correct, this should not have been done, as I am told, on excellent authority, that the process in Europe, for dyeing with the munjeet of Bengal, and the madder obtained from Bombay, and grown in France, &c., is very different, and the color is not the same. If you would have the goodness to cause two pieces of similar cotton cloth to be dyed in Calcutta, according to the local process, one with part of the Kangra munjeet I have already sent you, and one with Nepal munjeet, a fair comparison might be elicited as to their respective value and appearance as dye-stuffs.

I give you the Umritsur mode of dyeing with munjeet, premising that all the ingredients used are carefully weighed in proportion to the weight of the cloth to be dyed; the weight of munjeet being equal to that of the cloth. The unbleached cloth weighing, in this instance, 3 chittacks, or 15 tolas, is first washed in cold water and dried. At evening it is dipped in a mixture (saponaceous) of 1½ chittack of till oil and ¾ of a chittack of sujee (the impure carbonate of soda that abounds in this part of the country). Being thoroughly imbued with this ley, it is hung up to be dried. It is then washed three or four times successively in water with a small quantity of sujee, and dried each time. Finally washed in pure water and dried.

Two tolas of *mace* (the gallnut of the *Tamarix dioica,* largely used here,) are ground to a fine powder, and with 2 tolas of alum form a mordant, with the assistance of water, in which the cloth is dipped six or seven times, being well wrung and dried each time. Three chittacks of munjeet are pounded fine, and a small quantity of *mace* added in cold water. This water is heated, in the first instance, to

about 130 degrees, when the whole is taken out and hung up. At the second dipping, the water is heated to a higher degree, and on the third dipping is caused to boil for some three-quarters of an hour. The cloth is then wrung, dried and ready for use after a final washing in clear cold water. The dye is of course fast.

I cannot find on enquiry that any munjeet from the Kangra Hills has ever found its way into our market, and I believe Mr. McLeod told me the hillmen themselves did not know the use of it; but I hear that some munjeet has occasionally been brought from Kashmere, and is considered good.

I shall certainly continue my enquiries, and now try and obtain mature roots.

H. Cope.

At the meeting at which the above notes were read the Secretary placed on the table two pieces of cloth dyed after the local process, one with a portion of the Kangra munjeet received from Mr. Cope, the other with the Nepal munjeet received a few months ago from Dr. Campbell: they are both inferior in color, especially the Kangra munjeet-dyed specimen, to those received from Mr. Cope.

With the view of making our information on this point more complete, it is thought desirable to introduce in this place the local native process of dyeing the few pieces of cloth above referred to as given by the dyer, (Juggoo Bundhoo Sircar of Chitpore) :—

" About fifteen tolahs of each kind of munjeet were exposed to the sun ; when perfectly well dried they were broken into small pieces, and the bark taken off, leaving the pure dyeing substance, which, having been dried again, was reduced to powder.

" During this operation, two pieces of cloth, about 9 feet long and 2 feet broad, were well washed in clear cold water ; when dried they were washed in a decoction of the gall of

the hareetukee (*Terminalia chebula*) and dried; they were then laid over two tables and a thick liquid substance* previously prepared was put over them by means of a small flat piece of wood called "Pottaee;" the cloths being dried, were put for a brief period on the surface of the running water of the river Hooghly, and they were then thrown with full force ten times over a large flat piece of wood (such as used by washermen); they were afterwards dried, and when all this was done, the munjeet powder was put on the fire with about a seer of water in two different pots, and "Dhaeephul" (the flowers of *Grislea tomentosa*) which is used as a mordant: when the water was in a boiling state, the two pieces of cloths were put in these two pots, and were constantly shaken by means of a stick for upwards of six hours, during which time the fire was made to burn gently, that is to say, neither very strongly nor very feebly; the cloths were then taken out, washed in cold water, and dried.

*N. B. The above two dyeing substances have not had fair play, being tried upon cotton cloth: if tried upon silken cloth, greater justice would have been done to them."

At the following meeting in September a small muster of Neelghery munjeet was submitted by Dr. H. Cleghorn with the following note:—

The Neilgherry munjeet, the produce of *Rubia tinctoria*, is abundant on the higher slopes of these mountains. This indigenous dye is used to a considerable extent by the Badaga tribe, whose crimson-striped cloth is colored with this root, but I cannot learn that the article is exported for merchandise, although one or two small consignments are said to have been sent to Europe. Messrs. Flynn and Co., of Madras, applied to me for a quantity of the root, and prepared a cake of a carmine color, which produced satisfactory results. I am desirous to learn the opinion of Mr. H. Cope,

* This substance is composed of gum arabic, alum, and sugar of lead, the two latter are given in very small quantities.

as to the identity of this with Punjab munjeet. This twiner grows most luxuriantly in all the hedgerows about Ootacamund, and on the slopes down to Wynaad (3,000 feet), so that the root is procurable at the simple cost of cooly hire. I observed that the roots are larger and redder at the greater elevation, becoming knotted and duller as the altitude lessens. I will be happy to obtain for you a larger quantity of the stem and root, and to answer any questions regarding it.

*Report on the above sample of Neilgherry munjeet, by H. Cope, Esq :—*

I have the pleasure to acknowledge the receipt of the sample of munjeet on which Dr. Cleghorn asked you to obtain my opinion. It is impossible to say, from a mere specimen of the root, whether the munjeet now before me, and that of Affghanistan, are from plants of the same species or not, but if any dependence is to be placed on the difference between the two, I should be induced to think the species distinct. I have already mentioned that the Affghan species of *Rubia* is still unnamed, unless Dr. Griffith should have affixed a name to the specimens sent home, which might be easily ascertained from Sir W. J. Hooker.

The root sent by Dr. Cleghorn is much coarser, tortuous and thicker than that of the western root. I have submitted one sample to the inspection of three brokers of experience in Umritsur, and they consider that although containing coloring matter to a considerable amount, it is by no means so productive in this respect as the Ghuznee plant. I concur in this opinion, but think it likely that Dr. Cleghorn's sample was, like the Kangra specimen I sent you sometime ago, dug out of season. It should be remembered that, the cultivated species, both of Affghanistan and the south of Europe, the root of munjeet and madder, is considered unfit for dyeing purposes until the third year of its existence.

A copy of the above report, which closes the subject for the present, was sent to Dr. Cleghorn in November, 1859.

# Correspondence and Selections.

## Notes respecting certain specimens forwarded from Upper Assam in 1859

*(Communicated by* Capt. W. H. Lowther, *2nd in Command, Assam Local Battalion.)*

*Suddya, 20th May,* 1859.—I have sent a box to your address with sundries, as specimens of various products, *viz.*, "Aconite Poison", for experiment, one, at present, of peculiar interest, the lives of our soldiers on this frontier being concerned. Dr. White, of the Naval Brigade, was eminently successful in his treatment, sucking the wound by the use of the cupping glass. Out of twenty-five wounded Europeans only four died: one of these men in half an hour. Fortunately for humanity, the "Digarroo" tribes are the sole producers of this virulent drug, and they are chiefly peaceable traders, totally dependent on British territory for their small luxuries of life, *i. e*, salt, tobacco, cloth, spirits, cattle, &c. It is almost solely to the rascality of our *subjects* that the hostile tribes are now indebted for their comparatively small, and hence *adulterated*, supply of this root, which, under the present system of frontier trade, finds its way down into the shops of the covetous Hindostanee Bunneeabs, and thence oozes out in the transactions for rice and boats with the Mori Nomades of the Dihong, (as cunning and faithless a set of ryots as could be expected), and these in their turn purvey all they can get to the "Abors." Fortunately for humanity, I repeat, our enemies have to pay for their poison, and even then cannot obtain the genuine article, or our force would all be "dead men." The great Alpine region of the "Digarroo" country is described as abounding with the plant furnishing the *Bih*, as they call it (Query—*Aconitum ferox).* Last cold season I was out with a "Digarroo" hunting party: one of the men stalked a large female sambur deer feeding in the grass: he made a bad shot, merely ripping up the skin on her side, and off she bounded, followed by the active savage, who caught her up in her death struggles a few hundred yards. I am told the method of preparing the drug is as follows:—Bruise the root on a flat stone, gradually grinding it into a mass with

the fresh juice of the *Dillenia speciosa* fruit: while in this moist state it is to be kneaded to the required size on the wood of the arrow to be poisoned, a few deep notches being first cut just below the junction of the metal, that the weapon may break off into the wound. The "Singpho" people slay their elephants and rhinoceros after this fashion,—the hunter patiently tracking them till they drop, and which sometimes occupies many hours.

The Kamptees tell me they employ saltpetre both externally and internally in cases of wounds so poisoned with success: others profess to heal with seeds or barks of the jungles, and which I have seen administered to a wounded man without saving his life. However small and superficial the said arrow wounds, even those made with pointed bamboos, the pain is described as horrible, and the appearance is invariably highly inflamed, and attended with suppuration. Dysentery, too, is a usual feature, and concomitant of these venomous applications, and which seem to affect the Native less than the European system, to judge by the rapid recovery of the former under medical treatment. Thus I hope I have directed public attention to a new branch of military field surgery, and one which may possibly prove of some importance in the future warfare of our ultra-savage frontier; and I know of nothing more politically tending to pacify those turbulent Tartar hordes, than the bare fact, that we can cure our wounds, numerous though they be, although our bullets may fail to reach them in their lurking places. It ought to be known that Dr. White *sucked all the wounds himself*, like a veritable leech of the olden time, and made the caste gentry of the Native force stare in astonishment at this novel application of the sacred organ.

I have sent you a further supply of "Coptis Teeta" (before described), a famous tonic and a dye; and also of "Ghutaon," evidently the root of some "Valerian" of the Mishmee Alps: besides, being a popular perfume, it has the the repute of keeping rats and all other four-footed and creeping annoyances away from clothes and packages. A small batch of "Munjeet," from the Lower Mishmee Range (Debong), and I am promised seed. A small quantity of *Bon Rhea Twine* from the jungles on the Debong. Rude cotton clothes of the "cropped hair Mishmees," (the same people who gave the Munjeet), grain bags of same tribe made from *Urtica crenulata*, the Surat of Assam. Root of *Deó Báns*, and a pipe made of same. "*Cerasine*," a liqueur of my own preparation, entirely of indigenous products. Wood specimen of "*Bukun*," from timber 70 to 80 feet long. *Seeds* of *Oodál* and its fibre, other seeds, &c. Specimen of fine work in split rattan.

I have distributed much maize seed along the frontier; 'tis a favorite crop with all the savages, especially the Abors. I have turned out some very good of a large white kind with huge cobs, the second sowing in Assam, but has not much deteriorated. The Abors have promised to show samples; their hills, both soil and climate, are capable of producing maize of any country, but are too remote to be of any practical effect in the production of bulky agricultural grains. Sugar, tea, coffee, munjeet, and medicinal drugs would be more profitable.

I have planted out a few specimens of the wild coffee, as you suggested, for experiment as to its powers of improvement, but it seems to me that peculiar bitter aroma will not easily quit the berry. Grafting may possibly give us a new handy variety without that fault. You can form no idea of the obstacles attending Agri-Horticulture in this savage locality; 1st, the insects, their name is legion, some destructive by day, others by night: then the birds · our carrion crows there are addicted to maize as much as carcases: there are numerous feathered pests of smaller size, formidable from their collectiveness; then the *quadrupeds*, if you try any experiments on a new clearing in the vicinity of forests or swamps, nearly all of them nocturnal in their habits, as the sambur, hog, deer, buffalo, porcupine, and hare; lastly, the Genus Homo, more ignorant, obstinate, proud and exclusive than the really high caste animal of upper India: then there are the '*Khyahs*,' trading adventurers from Upper India, whose scheme is to get the entire population heavily into their books by advances of opium, cloth and cash at high interest, thus commanding the entire market from Suddyah to Goalparah, and dictating commerce and cultivation as it best pleases them. I will just show you what possible chance a white-faced "tiller of the soil," attempting to grow popular exports, would have against these Shylocks. I put a few acres of jungle grass land under mustard, to clear it economically, as I anticipated for a future wheat crop. The said mustard duly attained maturity, and I offered it for sale to the above worthies; they after much demur condescended to offer me twelve annas per maund, and a long time after fourteen annas, although the market price was at least double that amount. After humbugging in this fashion for two or three months, they declined to take it altogether, and I then quietly sent it over by boat to Debroogurh, where I found the scoundrels had already prepared the way for its stoppage, and there it still lies rotting in my godown under a sham offer of one rupee per maund.

*Suddya*, 30*th May*, 1859.—Herewith the long promised seeds of the dye *Room* plant, which, like most of our local *Ruellidæ*, seems to prefer a

moderate shade; I will send you by and bye a few small samples of cottons and woollen fabrics dyed with the same. The Kampti Chief who gave me the above has also promised me seed of another blue-dye yielding ***Ruellia,***—said to be a tall shrub of considerable dimensions, and lasting for ever, whereas the ***Room*** is a diminutive plant, and dies down to the roots periodically. He tells me this new kind has been lately brought in from the *Chinese* frontier (*Barra Chin*), and that I am to have some seeds in a few days, when I will of course send you the greater portion. I have been anxiously watching the *Khar-mar Ruellia* for a twelvemonth past, and can observe no signs of flowering. There it is *entirely* multiplied by offsets and cuttings; no native I have yet met with seems to have seen any inflorescence. It is remarkably tender, and although apparently vigorous at times, as often dies down suddenly, the decay of the root frequently following. From these circumstances, it is plain that the *Khar-mar* has been imported, together with many other curious and useful plants, from the Indo-Chinese frontier

## Timber and Forest Trees in the Punjab.

(*Minute by the Most Noble the Marquess of Dalhousie, Governor-General of India.*)

*Dated 24th February*, 1851.

1.—During the last season and the present, I have traversed the plains of the Punjab from north to south, and from east to west; not indeed visiting every district, but seeing quite enough of its several divisions, to enable me to judge of the physical character of the new province by my own personal observation, aided and confirmed by the information I have sought from the officers stationed throughout its bounds.

2.—There is one characteristic of this wide tract which could not fail to strike the least observant traveller, and which must be the source of constantly recurring regret to any one who looks upon the plains of the Punjab with interest, and with reference to the wants or advantages of its condition. I refer to the almost total absence of forest trees, and even of fruit trees and of bushes; leaving the whole territory one continuous stretch of unrelieved plain, neither adorned by the foliage which is its natural ornament, nor stocked with the timber requisite for a thousand purposes in the every-day life of the people who dwell in it.

3.—This is a manifest, and will be shortly felt to be an increasing evil, unless some measures are taken to provide at present a remedy for the future.

4.—It is unnecessary to enquire what were the causes which have led to this general want of timber. Whatever may be the cause, it certainly is not to be traced to any natural unfitness of the soil for producing forest and fruit trees, in any part of the country, which is not actual desert. In the district of Hoosheearpoor, and in the upper portion of the Manjha, exceedingly fine timber trees are to be seen, and mango groves, not surpassed by any which I have yet noticed in the older provinces. The rapidity too with which the trees planted in gardens have grown up, and in military stations in the Punjab which we have occupied only a few years, shews clearly that the soil, with a little care, is a grateful one; and that there is all the encouragement to a planter which rapid progress of his work, and an early return for his labours, are calculated to afford.

5.—While nature appears to me to offer no obstacles on her part to the future supply of this great deficiency, it is in my judgment of much importance that the Government should devise some means to that end, and should bring them into operation without delay.

6.—The deficiency of timber is already severely felt, not only in the large public works about to be undertaken, and in the provision of cover for the European troops; but in the hardship which it imposes on private individuals. by enhancing the cost of the residences, which in this new province they are compelled to build, far beyond what it would be under similar circumstances elsewhere.

In all the plains, and as far south as Mooltan, every beam which is used is brought from the mountains. Even of these the supply is not in our own hands, but depends upon the good will, or on the power to refuse it, of the Maharaja of Jumoo and Native Princes in the hills. At the moment at which I write, a complaint is already before me, shewing collusion between the Maharaja's Agent and the Wuzeer of the Chumba Raja, for the purpose of raising the price of timber already extravagantly high, of excluding all agency of ours from the forests, and of placing a monopoly of supply in the hands of these two persons. * * * * * * * * * The fact strongly illustrates the inconvenience and risk to which we are exposed by our entire dependence on Native States for the supply of what may, with truth, be called an article of necessity.

7.—Passing by the consideration of the additional enjoyment, which will be given to life by the creation of shady spots near to villages and

wells, and of topes scattered over the plain as they are seen generally in Hindostan, (although this consideration is not by any means to be disregarded,) I feel strongly the urgent duty of endeavouring to give to this country the clothing of forest trees, from my knowledge of the well-ascertained and beneficial effect which trees produce on the healthiness and fertility of the tracts in which they are found. No point has been more clearly established than this salubrious and fertilizing effect of foliage in an Indian climate. It has been the subject of much enquiry, and has been affirmed and demonstrated in every report submitted from different parts of India, many of which have passed through my hands, and one of which I forwarded to the local government in the Punjab some time ago.

8.—The question of fuel, too, is one which, though of less magnitude than the points to which I have adverted, ought not to be left out of our view. Already I have heard, from time to time, grievous complaints of the scarcity of fuel at the stations of the Punjab, and of its consequent dearness. In the absence of coal or any other substitute, wood fuel is the only resource of the inhabitants for use in domestic purposes. It forms comparatively a small item in the expenditure of officers, and those whose salaries are ample: but its scarcity produces a serious and injurious drain on the seven rupees a month of the sepoy, aud the still smaller pittances on which other classes in cantonments and cities are obliged to eke out a pinched subsistence.

In the villages even, I conceive, that abundant supply of wood fuel would produce an early beneficial effect; since it would remove the necessity to which the people are now driven of consuming as fuel the dung of their cattle, and would enable them to apply it to its ordinary and fertilizing uses as manure for their fields. I have been informed, during a recent portion of my present march, that the villagers are not indifferent to, or ignorant of, the value of manure for agricultural purposes, as I have sometimes been told was the case; and that they would readily employ it where it is not necessarily diverted to other uses.

9.—Such being the evils of a deficiency of trees, and so great the necessity for a remedy, it remains to consider how the remedy can be applied

My attention was given to the question early in the course of the first visit I paid to the Punjab. In the midst of so great a press of business of higher importance still, I abstained at that time from requesting the Board of Administration to give their attention to it. During the present tour I have found the evils of the present state of things meeting me every where I have conferred with some of the

local officers on the subject, and especially with Mr. Montgomery, in whose division the want is most conspicuous and most severely felt. The information I have received encourages me to bring the question at once under the consideration of the Board, in the belief that an effectual general measure may be now devised.

10.—It would manifestly be impracticable for the Government to conduct a general measure of planting trees in the Punjab exclusively by the agency of its own officers. To commence with good hope of success, and with the prospect of making satisfactory progress at the first, it will be necessary that we should have the feelings of the people going with the Government in its undertaking, and should enlist their aid, by convincing them of the advantages which the measure will afford to themselves. The information already in my hands induces me to believe that the people will not be insensible of their own interest in the scheme, and that slight encouragement by the Government will lead them to aid in it with spirit and zest.

11.—I conceive that the Government for this purpose should have recourse to the heads of the village communities, through which an already organized machinery, the selection of certain portions of land for planting, the setting of the plant, and the slight culture which will be requisite for a short time, together with the protection of them afterwards, may be generally and simultaneously conducted.

The district officers would have it for their duty to explain to the villagers the object the Government have in view, and to endeavour by all the means in their power to secure their co-operation.

12.—It will be for the Board to consider what portion of land attached to each village should be made use of for planting. Where uncultivated land can be made available, of course it would be best for the Government that it should be used Where it may be necessary to take land for planting, which is under the plough, it would be just and politic to make a certain remission of revenue, or remission of revenue for a certain time, perhaps five years.

The aggregate amount of revenue which would thus be remitted, even if the measure were made general at once, would probably not be very large. At the same time it would be large enough to make it of consequence that the Board should fix the quantity of area to be planted, and should instruct the officers not to use cultivated land for the purpose when unoccupied ground could be found.

13.—Care should be taken that the trees planted should be those which are calculated to become useful timber in time, and which general experience may indicate as suited to the soil.

Near to the villages and to the wells the villagers themselves will probably be ready enough to plant mangoes, &c., when their attention is once directed to it.

14.—The supply of plants for these purposes is a matter of detail on which I can give no useful advice or opinion, while ignorant of the facts. Upon it I shall await the information which the Board, on enquiry, may be able to communicate.

15.—The Government on their part may, in their several public works, be laboring to the same end. The Baree Doab Canal and all its branches should have its banks carefully planted by the Canal Officers concurrently with its progress. The district officers, connected with the Inundation Canals in the lower districts of the Punjab, should be instructed to introduce the same improvement, commencing at once.

On the great lines of road, the same may be done by the Executive Officers with good effect: and wherever a dâk Bungalow, or a public building, or a chokee, is erected, there, unless space be wanting, trees should be planted.

At all of these places trees will not only be refreshing and useful hereafter, but they will have the additional advantage of being looked after at the commencement. It is probable that the men at the chokees, &c., if properly managed, will take pleasure and pride in tending the young plants entrusted to them. If not, the care of them should be made a part of their duty for which they should be held responsible. There can be nothing in this incompatible with the duties of any man, whatever may be his employment.

In like manner, the head-men of villages should be made responsible for the protection of the plantations which may be made within their bounds.

16.—It only remains for me, in this outline of a general scheme, to advert to the possibility of ensuring an abundant and cheap supply of fuel near to large stations.

At Seealkote, where a large body of troops will be permanently placed, the supply which alone can be relied upon is more than fifteen miles distant, and across the river.

It is probable that here, as is the case at Lahore, some of those tracts which have been heretofore used as grass preserves, may exist. I would suggest the value of immediately planting some of those at Lahore, and any that there may be near Seealkote.

The wood to be fitly selected for this purpose should be one which is of quick and spreading growth, and which can be relied upon as of

the nature of copse, so that it may be cut for supply with regularity, and may be counted upon to reproduce itself within a certain period.

I am given to understand that several of the jungle bushes are of this nature, and of these there can be no difficulty in finding a sufficient number of plants to commence the Government fuel preserves at once.

17.—If I had not already had abundant proofs of the vigor, the perseverance and public spirit of the Board of Administration, I should feel some hesitation in proposing to them a task of such wide extent, whose advantages are all more or less prospective,—and whose full results must certainly be remote. As it is, I am confident that they will recognise with me the necessity of attempting some such design, and the advantages which would attend its successful accomplishment. I am confident that they, and the Officers under their authority, will enter into it heartily if it be found practicable, and will accomplish it if it be within the bounds of possibility.

None of us can live to see the complete result of that which we now propose to commence· few of us will gather the fruit where now we plant. But if we succeed in framing this design, advance it in some degree towards completion, we may at least enjoy the satisfaction of feeling that we shall leave behind us an heritage for which posterity will be grateful

(Signed) DALHOUSIE.

## ON THE COMPOSITION AND QUALITIES OF DIFFERENT KINDS OF OIL-CAKE.*

By PROFESSOR ANDERSON, M.D., *Chemist to the Society*

The progress of agriculture, and the system of high farming, which have had so remarkable an effect in increasing the use of artificial manures, have operated in a similar manner on the feeding of stock, and stimulated to an extraordinary extent the demand for imported, and what, as distinguished from the ordinary farm crops of this country, may with some degree of justice be termed artificial cattle-foods. So general has the use of the substance become, that on almost every farm where the feeding of stock is extensively practised, purchased food, which is almost entirely of foreign growth, is consumed to a greater or less extent. It is remarkable also that while the market price of the great staple crops of this country, and more particularly

* Address delivered at the Monthly Meeting of Agricul Society of Scotland, 14th December, 1859.

of the cereals, is not advancing, that of the imported cattle-foods, and especially of oil-cake, has undergone a decided increase ; and as, in spite of this enhanced price, there has been a material addition to the quantity consumed, it must be inferred that its use has been found profitable.

The consumption of oil-cake in this country has now reached an extent of which few persons are aware, and it may be a matter of some interest, if, by way of introduction, I enter into some statistical details on this point. The supply consists partly of imported, and partly of home-made cake. The quantity of the former, including rape-cake, and all other descriptions imported during the eleven years ending 1858, has been—

| | Tons | | Tons. |
|---|---|---|---|
| 1848, | 73,029 | 1854, | 76,230 |
| 1849, | 59,462 | 1855, | 80,659 |
| 1850, | 65,055 | 1856, | 83,256 |
| 1851, | 55,096 | 1857, | 99,265 |
| 1852, | 53,616 | 1858, | 80,629 |
| 1853, | 64,475 | | |

The average of the first four of these years gives 63,255 tons, and of the last four 85,952 tons ; so that within that period there has been an increase to the extent of more than 35 per cent. An exact estimate of the value of this quantity cannot be formed, unless we know how much consisted of rape and other inferior cakes, but as the quantity of these is small, I believe a very close approximation to the truth may be obtained by assuming the average price of £8 per ton, giving £687,616 for the annual value of imported cake

There is no means of ascertaining directly the quantity of cake manufactured in this country ; but it may be estimated indirectly with considerable accuracy from the imports of the different kinds of oil-seed. In the following table are given the quantities of linseed and rape imported in each of the last fifteen years :—

| | Linseed. | Rape-seed. | | Linseed. | Rape-seed. |
|---|---|---|---|---|---|
| 1844, | 616,947 qrs. | 68,884 qrs. | 1852, | 799,402 qrs. | 146,230 qrs. |
| 1845, | 656,793 „ | 47,677 „ | 1853, | 1,035,335 „ | 86,815 „ |
| 1846, | 506,141 „ | 87,662 „ | 1854, | 828,513 „ | 103,155 „ |
| 1847, | 439,512 „ | 47,523 „ | 1855, | 756,951 „ | 162,353 „ |
| 1848, | 799,650 „ | 79,970 „ | 1856, | 1,180,180 „ | 264,920 „ |
| 1849, | 626,495 „ | 29,480 „ | 1857, | 1,051,113 „ | 220,495 „ |
| 1850, | 608,984 „ | 107,029 „ | 1858, | 1,017,844 „ | 216,927 „ |
| 1851, | 630,471 „ | 82,394 „ | | | |

Taking the average of the first four and the last four years of this period, we have—

| | Linseed. | Rape-seed. |
|---|---|---|
| Average of the four years ending 1817, | 554,448 qrs. | 62,936 qrs. |
| „ „ „ „ 1858, | 1,001,552 „ | 216,173 „ |

*showing that the imports of linseed are now nearly twice, and of rape more than three times as great as they were at the commencement of the period. In estimating the quantity of oil-cake yielded by these seeds, it must be borne in mind that linseed is used for other purposes besides those of the oil-crusher; but the quantity diverted to these uses is not large, and I have ascertained from the best information at my disposal, that the linseed grown in this country, and of which no account is taken above, will be sufficient to cover all that is used for seed, in medicine, &c., leaving the whole of that imported free for the manufacture of cake. At 53lb per bushel, which is rather a low average, 1,001,552 quarters of linseed must weigh 189,568 tons, which, allowing 25 per cent for loss of weight in the process, must yield 142,156 tons of cake, which, at the average price of £9 per ton, must be worth £1,279,408. Rape-seed usually weighs from 49 to 50lb per bushel, and at the latter weight, 216,173 quarters must weigh 38,660 tons, and yield 28,950 tons of cake, costing at £5 per ton, £144,750.

The whole value of the oil-cake annually consumed in this country must therefore be as follows;—

| | |
|---|---|
| 85,952 tons imported oil-cake of all kinds, at £8, | £687,616 |
| 142,156 „ home-made linseed cake, at £9, .. | 1,279,404 |
| 28,950 „ „ rape-cake, at £5 .. .. .. | 154,750 |
| Total, .. .. . | £2,111,770 |

It is to be observed that the prices here assumed are considerably under the average of those which the farmer would at present pay, good linseed cake ranging from £9-10s. to £10-10s, and rape-cake from £5-5s. to £5-10s., but I have preferred to err on the safe side I have also taken it for granted that the whole of the rape-cake, both imported and home-made, is used for feeding, which is not correct, because some of it is employed as a manure. The quantity consumed in this way cannot be ascertained, but it is not very large, and is probably counterbalanced by small quantities of cake made from other seeds, such as hemp, sunflower, &c., which are not included in the foregoing estimates.*

* It may be interesting in this locality if I add the imports into Leith during the last ten years —

| | | | |
|---|---|---|---|
| 1850, .. .. .. .. | 4062 tons | 1856, .. .. .. .. | 6194 tons. |
| 1851, .. .. .. .. | 5253 „ | 1857, .. .. .. .. | 3889 „ |
| 1852, .. .. .. .. | 4315 „ | 1858, .. .. .. .. | 5654 „ |
| 1853, .. .. .. .. | 5577 „ | 1859 (up till Dec. 12,) . .. | 7107 „ |
| 1854, .. .. .. .. | 5558 „ | | |
| 1855, .. .. .. .. | 5081 „ | Average per year, .. .. | 5268½ „ |

From these data it appears that the farmer is at the present moment spending nearly as much money on oil-cake as on guano. I find, in fact, that the average quantity of guano of all kinds imported into this country and retained for home consumption, during the four years ending 1858, has averaged 245,802 tons, and this at £11 per ton, which, considering the large quantities of inferior guano, is a fair estimate, is worth £2,703,822; but as it is well known that during these years the importations were greatly in excess of the demand, and stocks accumulated in this country, it is probable that the actual expenditure fell considerably short of this sum.

No facts are better calculated to impress upon us the importance of a proper knowledge of the composition and qualities of different kinds of oil-cake than these statistics, which show us that the farmer is every year depending more and more upon such substances for the manufacture of the beef and mutton we consume, and indirectly, of course, also, for the supply of manure for his crops. The interest attaching to it must be still further increased in a season like the present, when the crop of turnips, straw, hay, and almost every other native cattle food is so greatly under the average, that all feeders, whatever their usual practice may be, will be forced to have recourse to some kind of imported food, among which oil-cake, which has so long recognised as a safe and useful article, will no doubt obtain a preference.

It is not my intention on the present occasion to enter into any general disquisition on the economic uses of oil-cake, or to discuss the question on which so much difference of opinion exists among practical men, as to whether it is most profitable to depend on home-grown or purchased food; or whether, as has been maintained by some individuals, the latter is not a source of positive loss. I fully admit the importance of these questions, and though their discussion would bring out many points of interest, they are foreign to my present object. It must be observed, however, that on theoretical grounds

Importations of linseed-cakes and rape cake into Leith during the last six years:—

| | linseed-cake. | rape-cake. |
|---|---|---|
| 1854, | 3358 tons | 2195 tons |
| 1855, | 3410 „ | 1671 |
| 1856, | 4230 „ | 1964 |
| 1857, | 2358 „ | 1536 |
| 1858, | 3697 „ | 1957 |
| 1859, | 3901 „ | 3206 |
| Average per year, | 3491½ „ | 2088⅙ „ |

These numbers are interesting, because they show that the rape-cake imported into Leith bears a very high ratio to the linseed cake, and that the farmers of this neighbourhood are fully alive to the advantages; and also because they indicate the effect which the short crop of this season has already had in increasing the imports, and that the quantity which will be used during this winter will be greatly above the average.

their high nutritive value admits of no question, and the statistics just given must be taken as affording very strong evidence that theory and practice are at one on this point. The progress of agriculture during the last twenty years has forced the farmer to watch, much more carefully than he ever before did, the effects produced by all the articles, whether of food or manure, which he employs, and to attend more minutely to their economy; and it is inconceivable that, during the very time when accurate experiment has come to be almost a part of his business, he should have doubled his consumption of those kinds of food, if their use were actually unprofitable. The comparative profit derivable from oil-cake and home-grown food is a question of much greater nicety, and to which no general answer can be given, for it depends on an infinity of circumstances varying in every possible way, and producing opposite results in different cases. With these points, however, I have at present nothing to do. I am content with the fact, that a very large quantity of oil-cake is annually consumed, and my object is to point out to the farmer the nature of that article, the precautions to be adopted in its purchase, and to bring under his notice such kinds as are little known, and of which it might be advantageous to encourage the manufacture. I have at different periods published in the Transactions of the Highland Society many analyses of different kinds of linseed-cake, and of such rarer varieties as came under my notice, to which it will not be necessary for me to recur in detail. I have since obtained a considerable number of other kinds, some of them through the kindness of Professor John Wilson, who got a number of sample-cakes, which had been pressed at one mill from perfectly genuine seeds, and which is therefore valuable as standard specimens.

*Linseed Oil-cake.*—Linseed cake, which is the staple, and much more extensively consumed than any others, when of good quality, differs but little in composition. The averages deduced from a large number of analyses is—

| | |
|---|---|
| Water, | 1.079 |
| Oil, | 12.47 |
| Albuminous compounds, | 28.53 |
| Mucilage, sugar, &c, | 35.78 |
| Fibre, | 6.32 |
| Ash, | 6.11 |
| | 100.0 |
| Nitrogen, | 4.56 |
| The ash contains— | |
| Earthy phosphates, | 2.92 |
| Phosphoric acid combined with the alkalies, | 0.38 |

Particular samples, of course, vary to some extent from this standard, but the difference is not very large, and chiefly affects the proportion of oil, which is generally rather lower in British-made cake, owing to the superiority of the machinery used in the oil-mills of this country. When the oil is low, it will in general be found that the albuminous compounds are above the average. In judging of the value of any cake, attention must be directed to the oil and albuminous substances in the first instance, but it is also important to observe that the fibre and ash should not be large. An excess of the former generally indicates the presence of some foreign matter, and of the latter, the cake has been made from dirty seed, probably containing a quantity of sand, and in that case it is objectionable from its tendency to produce intestinal irritation in the animals fed on it. In estimating the value of any sample, however, it will not do to rely exclusively on the analysis, for instances occur in which a cake may have a composition but little different from the average, and yet be of inferior quality. A remarkable instance has lately come under my notice, in which a sample, giving the following results, was analysed :—

| | |
|---|---|
| Water, | 9.04 |
| Oil, | 9.30 |
| Albuminous compounds, | 27.75 |
| Mucilage, sugar, &c., | 35.93 |
| Fibre, | 5.25 |
| Ash, | 12.73 |
| | 100.00 |
| Nitrogen, | 4.44 |
| The ash contains— | |
| Earthy phosphates, | 1.99 |
| Phosphoric acid, combined with the alkalies, | 0.95 |
| Sand, | 7.06 |

On examining the sample, it was at once apparent that, notwithstanding these results, it was extremely impure, and contained a large quantity of grass and other seeds, among which I detected some grains of what appeared to be blighted rye

Owing to the general similarity in composition of many kinds of seed, it is perfectly possible that an oil-cake may be adulterated to a very considerable extent without its being apparent in the analysis, and hence it is necessary to submit the sample to a very careful examination before forming an opinion on this point.

The question of the adulteration of linseed-cake is considerably narrowed by an important commercial consideration. It yields an oil distinguished by its tendency to harden into a solid varnish, and hence called a drying oil; and it is impossible to adulterate this oil

with any other without producing such a deterioration of its characteristic properties as to be immediately obvious. Hence linseed oil-cake is never adulterated with another kind of oil-seed? but when an admixture occurs, it is usually with some cheap non-oleaginous seed, and most generally with grass seeds. In the great majority of instances in which this occurs, the seeds have not been deliberately added as an adulteration, but are due to the careless cultivation of much of the linseed used abroad. It is difficult, of course, to form an opinion as to when inferiority due to dirty seed ceases, and positive adulteration begins; nor is the determination a matter of much importance in a practical point of view.

In judging, therefore, of the goodness of the cake, attention must be paid to its general appearance. It should be in hard well-pressed cakes, which show no tendency to split into layers. Its colours should be reddish, and, when broken across, its appearance should be uniform, and the smooth and glistening outer coat of the seed should be apparent. It should then be carefully examined for foreign seeds. Among these are frequently found small black seeds, which are hard, and have not been broken in the mill. These are often considered by the farmer to be injurious to the cattle; but it does not appear that this opinion is well founded, for they belong to various species of Polygonum, a genus which is not poisonous. They are objectionable, no doubt, because they are indigestible; and as they are so small that no difficulty would be experienced in separating them from the linseed, they are an indication of dirty seed; and where they are abundant, it is not uncommon to find the quantity of sand large. Grass seeds, fragments of flax-straw, and of the capsule in which the seeds are contained, may all occasionally be observed, and, when they are abundant, should be noticed. As far as possible some judgment should be formed as to the proportion in which these substances are present; and as grass seeds resist to a considerable extent the crushing process, they may with patience be picked out in considerable quantity. Some of the cake should then be reduced to powder, and mixed with cold water, when it ought to form a thick and firm paste; and if they be used in the proportion of one hundred grains of cake to an ounce of water, the paste should be so stiff as to retain the form into which it is made. This character is of great importance, because almost every other seed which can be used as an adulterant diminishes the stiffness of the paste; and the only other substances which possess a sufficiently mucilaginous character are oily seeds, which cannot well be mixed with it. The general appearance of the paste—its

peculiar colour and texture—are also characteristic. Of more strictly chemical tests there are few to be relied upon. One of the best is to mix a small quantity of the paste with a dilute solution of caustic potash; if the fluid acquires a yellow or green colour, something is wrong; but, on the other hand, adulterants may be used which fail to give any indication with potash

While attention to these points will enable the observer, in many instances, to detect the inferiority of an oil-cake, it is no unfrequent occurrence to find specimens in which the eye detects nothing amiss, but which analysis shows to be inferior. Not long since I examined a sample which was particularly well pressed, was in remarkably neat cakes, and showed to the naked eye not the slightest appearance of foreign seeds, but analysis proved its composition to be as follows :—

| | |
|---|---|
| Water, | 10.81 |
| Oil, | 9.01 |
| Albuminous compounds, | 21.35 |
| Mucilage, sugar, &c., | 39.96 |
| Fibre, | 9.36 |
| Ash, | 9.51 |
| | 100.00 |
| Nitrogen, | 3 41 |

The small proportion both of oil and albuminous compounds in this sample is remarkable, the latter being as much as seven per cent below the average. It was afterwards so far explained by information I received, that, at the mill where it was made, it was the practice to mix with the linseed a small quantity of bran or thirds, not as an adulteration, but because it had been found that the seeds pressed better. and gave a larger yield of oil. On examination with the microscope, I found that it did contain some granules of starch, apparently of wheat, but the quantity was not large, and I can scarcely imagine that this was the sole cause of the small proportion of albuminous compounds. Other instances of cakes of similar composition have come under my notice.

*Rape-cake.*—The use of rape-cake for feeding has become very common in this country of late years, and bids fair to extend itself still further, as the results obtained from its use have been very favourable, where proper precautions have been taken. Its composition may be best judged of from the following analyses. No. 1 was made from German rape grown on the Eyder, and is one of the sample-cakes I owe to Professor Wilson. No. 2 is described as best quality green rape-cake made expressly for feeding :—

| | I. | II. |
|---|---|---|
| Water, | 6.95 | 10.43 |
| Oil, | 8.63 | 12.50 |
| Albuminous compounds, | 29.75 | 27.68 |
| Mucilage, sugar, &c., | 38.72 | 29.75 |
| Fibre, | 7.30 | 12.47 |
| Ash, | 8.65 | 7.17 |
| | 100.00 | 100.00 |
| Nitrogen, | 4.76 | 4.43 |
| The ash contains— | | |
| Earthy phosphates, | 2.93 | 2.32 |
| Sand, | 1.24 | 0.63 |

The composition of this cake does not differ materially from that of linseed. It differs from it, however, in its peculiar bitter taste, which is immediately distinguishable, and makes it at first less palatable to cattle. It is also more liable to adulteration, for the peculiarity of the oil, which restricts the number of adulterating substances that can be used with linseed, does not exist here, and other oleaginous seeds may be mixed with it without appreciable injury to the quality of the oil. On the other hand, the low price of the oil and cake prevents the use of all but the cheapest materials for this purpose.

Rape-cake of good quality is distinguished by its greenish colour, and by its more mottled appearance. When broken, the yellowish pieces of the seeds, and the dark fragments of the outer coat, may often be very distinctly seen. When mixed with water in the proportion of a hundred grains to the ounce, it forms a semi-fluid paste, which runs like a thick fluid. The general colour is pale, studded with the dark-brown particles of the outer husk. Its smell is oleaginous. Caustic potash gives a strong green colour. These qualities vary considerably in different samples, and sometimes the general colour of the cake is brownish and very uniform, and a good deal appears to depend on the way in which the seed has been pressed; but when made into a paste with water, its appearance is very characteristic, and cannot well be confounded with that of other common cakes.

The chief adulteration of rape-cake is with mustard. It is probable, however, that the substances used is not the entire mustard-seed, but the dross obtained in preparing it for table use. This consists chiefly of the external coat of the seed, and hence is distinguished by a comparatively large proportion of fibre.

The two following analyses of cakes, made from brown and yellow mustard dross, will serve to illustrate their general composition:—

| | Brown. | Yellow. |
|---|---|---|
| Water, | 8.44 | 8.76 |
| Oil, | 6.79 | 5.91 |
| Albuminous compounds, | 23.87 | 19.81 |
| Mucilage, sugar, &c., | 24.93 | 33.91 |
| Fibre, | 22.27 | 26.16 |
| Ash, | 13.70 | 5.45 |
| | 100.00 | 100.00 |
| Nitrogen, | 3.82 | 3.17 |
| The ash contains— | | |
| Earthy phosphates, | 1.68 | 1.90 |
| Sand, | 3.07 | .64 |

It will be obvious that, though the proportions of the constituents of these substances differ considerably from those of rape-cake, there is nothing to prevent their being mixed with it to the extent of 10, 20, or even 30 per cent, without producing an effect on the analysis sufficient to attract attention. Nothing, however, is easier than to detect mustard in a cake; all that is necessary is to mix it with a sufficiency of cold water to form a soft paste, and leave it for some time, when the pungent smell of mustard will become more or less apparent. If the quantity is large, it can be detected almost immediately; but in all cases it is advisable to leave it for some hours, as the smell becomes more and more apparent, but after six or eight hours it begins to diminish again. Mustard-dross, when mixed with water, does not form a paste, but the particles sink to the bottom, and leave the water above with a more or less yellow colour. As it consists chiefly of the husk of the seed, it can be detected by the unusually large quantity seen in the paste formed by mixing the suspected rape-cake with water. It may also be distinguished by its microscopic characters, which are very different from those of rape.

Of late years, seeds have been imported into this country under the name of rape which belong to an entirely different plant. These are occasionally mixed with true rape, and sometimes substituted for it; and as their properties are highly deleterious, it is right that they should be guarded against; and bad effects have already occurred from their use. The seed in question is imported from the East Indies, and is commonly known as East Indian rape. Three different kinds at least have been imported—Calcutta rape, which is a small round seed not unlike the true rape, but more grey and less polished on the surface; Brown Guzerat rape is a somewhat larger seed, of a bright brown externally, and yellow inside; and Yellow Guzerat is a fine

yellow colour both outside and inside. The confusion of these seeds with rape is an interesting illustration of the evil consequences resulting from the neglect of science on the part of commercial men. Had they consulted the botanist, they would have learned that these seeds could not possibly be rape, because that plant is not a native of tropical climates, and that they must belong to some other genus. In fact, on examining the microscopic characters of the seed, I satisfied myself that it belongs to the genus *Sinapis*, which includes mustard and similar plants. The seeds are excessively pungent to the taste, and, when moistened with water, soon exhale the mustard smell.

An analysis of cake made from Calcutta rape gave—

| | |
|---|---|
| Water, | 7.93 |
| Oil, | 13.86 |
| Albuminous compounds, | 31.79 |
| Mucilage, sugar, &c., | 20.26 |
| Fibre, | 12.56 |
| Ash, | 13.57 |
| | 100.00 |
| Nitrogen, | 5.09 |
| The ash contains— | |
| Earthy phosphates, | 54 |
| Sand, | 2.48 |

And its general resemblance to true rape-cake is very great, its colour being similar, and its appearance completely that of a good cake. It was not without interest that I noticed, a few months since, a case in the neighbourhood of Gloucester, in which an action was brought against the manufacturer of a rape-cake which had occasioned the death of some cattle. The cake was examined by Dr. Voelcker, and declared to contain mustard. The manufacturer, in his defence, asserted that he had used East India rape, and I immediately recognised the seed, which I had ascertained to be a species of mustard. It is not at all improbable that similar cases have occurred before, and it is fortunate that we possess an easy and infallible method of detecting such impurities.

*Poppy Cake.*—The manufacture of poppy-cake is carried on to a considerable extent on the continent, and it is occasionally imported into this country, though not in any great quantity. The imports of the seed are also small The sample cake which I examined was manufactured in this country, it contained—

| | |
|---|---|
| Water, | 6.56 |
| Oil, | 11.04 |
| Albuminous compounds, | 34.03 |
| Mucilage, sugar, &c., | 23.25 |

| | |
|---|---|
| Fibre, | 11.33 |
| Ash, | 13.79 |
| | 100.00 |
| Nitrogen, | 6.59 |
| The ash contains— | |
| Earthy phosphates, | 5.28 |
| Sand, | 3.77 |

Poppy-cake has generally a pale greenish grey colour. Its cross fracture has a very uniform appearance, and its powder is nearly white. Its smell is somewhat oily, and its taste bland and pleasant; mixed with water, it forms a mucilaginous paste, less thick than that produced by linseed, and nearly white in colour. I am not aware that poppy-cake is adulterated. There is little inducement to mix it with other oily seeds, because it yields an oil of such quality that it may be used for cooking, and the admixture of any other renders it unfit for this purpose. As, moreover, the seeds are almost perfectly white, the colour of the cake would be so much altered by adulteration as immediately to attract attention. As a cattle food, poppy-cake holds a very high position; indeed, as a source of the flesh-forming constituents, it is superior to linseed-cake. It has been favourably spoken of by those who have made use of it, but I am not aware that the results of any precise experiments have been made public.

*Rübsen Cake.*—This cake, which is made from the seeds of the *Brassica præcox*, does not appear to be a frequent import into this country. It contained—

| | |
|---|---|
| Water, | 5.71 |
| Oil, | 11.00 |
| Albuminous compounds, | 26.87 |
| Mucilage, sugar, &c., | 31.47 |
| Fibre, | 16.95 |
| Ash, | 8.00 |
| | 100.00 |
| Nitrogen, | 4.30 |
| The ash contains— | |
| Earthy phosphates, | 2.76 |

This cake has a greenish colour and a very uniform appearance, both on the surface and in the interior. Its powder is pale greenish. and its taste agreeable, with the faintest possible degree of bitterness: with water, it forms a rather thin paste. It is distinguished from the preceding cakes by the larger proportion of fibre contained in it, by which the mucilage, &c., are proportionately diminished. In its other constituents it does not differ materially from linseed or rape.

*Dodder.*—The cake obtained from the seeds of the *Camelina sativa* has been frequently imported into this country in small quantities, but does not appear to have come much into use, partly, in all probability, because the supplies are limited. The composition of the sample cake was found to be:—

| | |
|---|---|
| Water, | 7.26 |
| Oil, | 7.99 |
| Albuminous compounds, | 29.00 |
| Mucilage, sugar, &c., | 27.04 |
| Fibre, | 16.12 |
| Ash, | 12.59 |
| | 100.00 |
| Nitrogen, | 4.64 |
| The ash contains— | |
| Earthy phosphates, | 1.81 |
| Sand, | 7.07 |

Dodder is very easily distinguished from any other variety of cake by its yellow colour, which is equally distinct on the surface and in the interior. Its taste is at first mucilaginous, but after a time a remarkably strong turnipy taste makes its appearance, which remains for some time on the tongue. With water, it forms a paste which is nearly as stiff as that produced by linseed, and gives off a strong turnipy smell. In point of composition, the cake calls for no special observation; its quality is good, and the only objection to it is the rather large proportion of sand in its ash, which, however is unavoidable in so small a seed. It is probable that its strong taste may render it unsuited to feeding milch cattle, as it may affect the taste of the milk, but for stock it will be quite as useful as rape or even linseed.

*Teel or Sesamum Cake.*—Several species of the genus *Sesamum* have been long cultivated as oil-plants in India, and their seeds have occasionally been imported into this country, and of late years to some extent. I have recently had an opportunity of examining two samples of this cake—No. I. I owe to Professor Wilson; No. II. was imported into Leith. Their analyses gave—

| | I. | II. |
|---|---|---|
| Water, | 1.56 | 10.38 |
| Oil, | 17.12 | 12.86 |
| Albuminous compounds, | 29.59 | 31.93 |
| Mucilage, sugar, &c., | 17.01 | 21.92 |
| Fibre, | 21.15 | 9.06 |
| Ash, | 13.60 | 13.85 |
| | 100.00 | 100.00 |
| Nitrogen, | 4.73 | 5.11 |
| The ash contains— | | |
| Phosphates (earthy), | 2.03 | 5.00 |

The first of these samples had a reddish colour on the surface, and pieces of the white kernels of the seeds were here and there visible. In the cross fracture, the distinction butween the outer coat and the interior of the seeds was particularly distinct. Its taste is bland, but not mucilaginous, like that of linseed; mixed with water it becomes brown, and if they be in the proportion of 100 grains a cake to an ounce of water, the mixture is quite fluid, and the particles sink to the bottom, and occupy abont two-thirds of the bulk, while the supernatant fluid has a dark colour. The Leith sample was very pale-coloured, and dull and dusty on the surface. Its fracture was light-coloured, and it was very soft and easily broken. Its taste was pleasant. The first sample was made from a very small species of Sesamum, the seeds being rather smaller than linseed, and their coats being thick, the large proportion of fibre becomes intelligible. Several of the species cultivated in India have seeds as large as a grain of wheat, and these would in all probability have yielded a still better cake. It is much to be desired that the importation of this seed should be encouraged. The great objection is the cost of carriage, and I understand that the importation of the cake is not profitable unless freights be very low.

*Sunflower Cake.*—The well-prepared sample of this cake was found to contain—

| | |
|---|---|
| Water, | 8.00 |
| Oil, | 8.94 |
| Albuminous compounds, | 21.68 |
| Mucilage, sugar, &c., | 19.05 |
| Fibre, | 33.00 |
| Ash, | 9.33 |
| | 100.00 |
| Nitrogen, | 3.47 |
| The ash contains— | |
| Earthy phosphates, | 3.54 |
| Sand, | 1.37 |

This cake is externally of a reddish-brown colour, and in the interior is very irregular, showing pretty large fragments of the outer coat of the seed. Its taste is faintly bitter, and it feels tough and woody between the teeth. Mixed with water, it does not form a paste but separates from it on standing. Its quality, as will be seen from the analysis, is not high, and especially the large quantity (33 per cent.) of woody fibre reduces its nutritive value very considerably below that of linseed or rape cake. At the same time it is a cake which may be used with advantage, if it can be obtained at a low price.

*Niger Cake.*—About two years since I directed attention to this cake in the Transactions of the Highland Society, and published the only analysis of it I have yet seen. I was at that time unable to ascertain the seed from which it is prepared, but I have now learned that it is the *Guizotea Oleifera.* It is black, shining, and about a quarter of an inch in length, and very thin, with a rather pleasant oleaginous taste. In the analysis of the cake, made two years since, I expressed a high opinion of its value, but remarked that a single analysis was not be altogether relied upon. The subjoined analysis gives a somewhat lower value, although still sufficient to make it a useful cattle-food :—

| | |
|---|---|
| Water, | 6.23 |
| Oil, | 6.58 |
| Albuminous compounds, | 25.74 |
| Mucilage, sugar, &c., | 42 18 |
| Fibre, | 11.15 |
| Ash, | 8.12 |
| | 100 00 |
| Nitrogen, | 4.10 |
| The ash contains— | |
| Phosphates (earthy), | 2.98 |
| Sand, | 1 66 |

*Hemp Cake.*—The analysis of a sample of cake made from hemp-seed gave the following results :—

| | |
|---|---|
| Water, | 7.21 |
| Oil, | 7.90 |
| Albuminous compounds, | 21.47 |
| Mucilage, sugar, &c, | 22.48 |
| Fibre, | 25.15 |
| Ash, | 15.79 |
| | 100.00 |
| Nitrogen, | 3.42 |
| The ash contains— | |
| Earthy phosphates, | 3.50 |
| Sand, | 7.76 |

Hemp cake has a greenish colour, and is sure to be studded with shining fragments of the husk of the seed; and when broken, the distinction between the husk and yellowish kernel is very distinctly seen. Its taste is bland but rather oily, and the husk feels rough and gritty under the teeth. Mixed with water, in the proportion of a hundred grains to the ounce, it does not form a paste, but sinks to the bottom of the glass, and only occupies about half the bulk of the fluid. The powder which it deposits is brown, and large fragments of the husk may be observed in it The quantity of fibre contained in it

is large, and the mucilage and other respiratory principles small; and, altogether, its quality must be looked upon as considerably under that of most varieties of cake.

*Earth-nut Cake.*—In the year 1855, I published two analyses of earth-nut cake. That which follows is of the sample cake supplied me by Professor Wilson. It differs very considerably from either of the two previous samples, and is remarkable for the unusually large quantity of albuminous compounds contained in it:—

| | |
|---|---|
| Water, | 8.62 |
| Oil, | 8.86 |
| Albuminous compounds, | 44.00 |
| Mucilage, sugar, &c., | 19.34 |
| Fibre, | 5.13 |
| Ash, | 14.05 |
| | 100.00 |
| Nitrogen, | 7.04 |
| The ash contains— | |
| Earthy phosphates, | .14 |
| Sand, | 13.47 |

The cake has a very pale-grey colour, rather reddish outside. Its cross fracture shows fragments of the kernel, and its powder is very light in colour. Its taste is bland and oily. It does not form a paste with water, and the particles fall to the bottom of the vessel, and leave a colourless fluid about one-fourth of the whole bulk. As a source of the flesh-forming elements, this cake would stand at the head of the list. It is only right, however, to observe, that it appears to be an exceptional sample, the previous analyses having shown only 26.71 and 33.85 per cent. of albuminous compounds, and it seems probable that these are nearer the average. The sample cake had been made from the kernels of the nut, from which the outer shell had been very completely removed. It is possible that the previous samples may have contained the husk; but, as specimens have not been preserved, I am unable now to determine whether this is the case.

*Pea-nut Cake.*—Some time since a sample of cake was sent to the laboratory under this name, but without any further information. I have failed to ascertain the name of the seed fron which it is made, but I understand it is imported ready-made from America. It contained—

| | |
|---|---|
| Water, | 9.20 |
| Oil, | 7.62 |
| Albuminous compounds, | 22.25 |
| Mucilage, gum, &c., | 30.25 |
| Fibre, | 26.97 |
| Ash, | 3.71 |
| | 100.00 |
| Nitrogen. | 3.56 |

The cake has a very coarse appearance, and is full of pieces of fibrous matter. Its taste is not disagreeable, and it does not form a paste with water. It is not a cake of high quality, but, if moderate in price, may doubtless be used with advantage. It is probable, however, that this was an inferior sample. At least I learn from Mr. Maclagan, of Pumpherston, that a quantity of this cake, which he had some years since, did not agree in appearance with my sample, but was very uniform, and quite devoid of fibrous matter. He was well satisfied with the results of its use.

*Cotton Cake.*—It is not my intention to enter at present into any details regarding the composition of cotton cake, because it has been frequently discussed of late. I believe I was the first person to direct the attention of the farmer to its value as a feeding-stuff, by an analysis published nearly ten years since. Other analyses have since been made public by myself, and Professor Way and Voelcker, and the latter has recently produced an elaborate paper on the subject. It will be sufficient for me to point out that there are now two varieties in the market, the decorticated and the common, The former, which is the best, is distinguished by its uniform yellow colour; the latter is filled with large pieces of the dark-brown husk of the seed, which serve at once to distinguish it. This kind must be used with much caution, as bad effects have sometimes been observed. I believe, however it may be used without risk, provided it be made from Sea-island cotton-seed, the peculiarity of which is, that, when passed through the gin, the fibre of the cotton can be entirely removed from it, and the seed comes out perfectly clean. In all the other varieties a quantity of cotton sticks to the seed, and when this is made into cake without being decorticated, the cotton soon produces inflammatory symptoms in the animal which has fed on it, and death is the result. But when of good quality, and carefully used, it is a valuable addition to our list of feeding-stuffs, and its importation is now considerable.

*Cress Cake.*—A sample of this cake accompanied those sent me by Professor Wilson. It contained—

| | |
|---|---|
| Water, | 13.10 |
| Oil, | 7.68 |
| Albuminous compounds, | 20.25 |
| Mucilage, sugar, &c., | 35.44 |
| Fibre, | 10.87 |
| Ash, | 12 66 |
| | 100.00 |
| Nitrogen, | 3.24 |
| The ash contains— | |
| Earthy phosphates, | 2.27 |
| Sand, | 3.14 |

The cake forms a thick paste with water, which exhales a very pleasant smell, exactly like that of new hay. Its taste is very pungent, and for this reason there seems little chance of its being useful for feeding, although it might be employed with advantage as a manure.

I have thus pointed out the composition of a considerable number of substances which are well fitted for feeding stock, and some of them quite equal to linseed and rape cake. At the present moment their importation is trifling compared with those of the well-recognised varieties, and there is always a greater or less disinclination to use them so long as the others can be obtained. It is most desirable, however, that this should no longer exist, and that careful experiments should be made with every kind of imported, so as to ascertain how far actual experience corresponds with the results of analysis. I have myself no doubts on this point, but I am well aware that the confidence of the public will be increased by knowing that they have been successfully used. The facts I have stated at the outset are sufficient to show how much the farmer is interested in this matter, and in the question of the extent to which the high-priced linseed-cake, can be replaced by other and cheaper substances. His interests in this respect are at one with those of the consumers of oils of all kinds, for of late years that commodity has greatly increased in price, and the discovery and importation of cheap oil-seeds is a matter of much economic importance. At present, we rely almost entirely on the oil-plants of Europe, but large and important supplies might be obtained from warm climates, and their importation would be greatly encouraged if there is a probability of a fair price being obtained for the cake they yield. The extent to which this must operate will be obvious, when it is known that a ton of linseed costs from £15 to £17, and a ton of the cake it yields from £9 to £10-10s. The importation of the earth-nut chiefly from the coast of Africa, aud of teel from India, are instances of imports which might be greatly extended; and there are doubtless many other tropical oil-seeds which might be imported into this country. The cultivation of such plants is well worthy the attention of those interested in developing the resources of some of our colonies, and especially of India, for there is no doubt that they would meet with a ready market at moderate prices. In fact, the consumption of oil might be increased to a great extent by a reduction of price, and the use of mineral oils, which has sprung up within the last seven or eight years, is the best proof that the supply of vegetable oils is insufficient to meet the demand; and anything which retards their use, restricts the supply of cattle-food available for the farm.

During the present season, the use of oil-cake derives additional importance from the short crops of ordinary cattle-food, and the circumstances under which it will be employed will probably render some deviation from the usual practice necessary. In general, oil-cake is used as a supplementary food, and for the purpose of obtaining a larger amount of nutriment within a given bulk. The quantity of the bulky foods, such as the turnip and straw, which an animal will consume, is not dependent on the quantity of nutritive matters they contain, but upon the capability of the stomach to contain them; and an animal ceases to feed, not because it has taken in all the nutritive matters it is capable of consuming, but because the sense of repletion causes it to stop. We increase the rapidity of the fattening process by giving the animal a more concentrated food, which enables it to consume a larger quantity of nutritive matter without producing the same sense of repletion. On the other hand, if the bulk of the food be too much reduced, the animal will go on feeding till the stomach is filled to the extent necessary for the proper performance of the function of digestion, and there may thus be a serious waste of nutritive matters. Under ordinary circumstances, where the oil-cake constitutes a limited and comparatively small part of the food, this is rarely if ever observed; but when, as will in all probability be the case this season, the quantity given to the animals will be larger, there is more danger of its occurring; and it will be well that it should be borne in mind that, under such circumstances, it may be advisable to add to the bulk of the cake. This can be easily done by making it up into a mucilage or paste with five or six times its weight of water.

I have only to add, in conclusion, that though I have analysed all the cakes I have been able to obtain, there may be many varieties which have not come under my notice; and as I am anxious to make my examination as complete as possible, I shall esteem it a favour if any one who happens to see rare and hitherto unanalysed cakes, will send samples to the laboratory. For this purpose, three entire cakes of each kind will be useful, so that a specimen may be preserved for the Society's Museum; and their value would be still further increased if accompanied by specimens of the seeds and oil; a couple of pounds of the former, and a quart of the latter, being sufficient quantities. —*Journal of Agricultural Society of Scotland for January*, 1860.

INTRODUCTION OF THE TEA PLANT INTO THE UNITED STATES.

A few years ago the United States Government was led to take measures for the introduction of the tea plant into the Confederation, with a view to establishing, if possible, the preparation of tea in some of the States. The success that had attended Mr. Fortune's operations for the East India Company, having induced them to consult that gentleman, it was finally arranged that he should again proceed to the Celestial Empire, for the purpose of obtaining as abundant a supply of plants for the west as he had secured for the east. His mission has been attended with the most complete success. A minute of the United States Patent Office now before us, states that he was despatched in March, 1858, that he had obtained seeds enough to plant 100 acres, a large portion of which had arrived by the 20th June, 1859, and was flourishing in a propagating house, especially constructed at Washington for their reception. Applications for plants were even then made in such numbers, that it had become necessary to refer to Congress for instructions as to their disposal

Mr. Fortune returned to England some time ago, and has favoured us with the following interesting report upon the final result of his expedition:—

"It will be seen by the accompanying papers that the results of my expedition to China, for the Government of the United States, has been very satisfactory. In little more than one year about 50,000 tea plants, and many other vegetable productions useful in the arts, or of an ornamental character,* have been introduced to America from the tea countries of China.

"This success was mainly owing to experience acquired during former visits to these countries. Arriving in China in the month of May, I spent the first few months in visiting numerous tea farms in different parts of the country, where I made arrangements with the natives for large supplies of seeds so soon as they ripened in the autumn. In October and November I repeated my visit to the same districts, and everywhere found supplies of seeds awaiting me. In former transactions with these tea growers, I had always treated them kindly and liberally, and I now found the advantage that resulted from such treatment. Seeds had been saved for me in all directions;

* For example: the Camphor and Tallow trees, Chusan Palm, green dye plant (*Rhamnus*), manure plants (*Trifolium* and *Coronilla*), Wax-insect tree (*Fraxinus Chinensis*), Yang-mae (*Myrica sp.*), southern fruits, such as the Lee-chee, Longan, Wampee, &c. &c.

I had only to pick them up and proceed onwards, and was thus enabled to get though a large amount of work in a short space of time. In December I reached the seaport of Shanghai, with the whole of my collections in excellent condition.

"Tea seeds will not retain their vitality long if kept out of the soil. In order to guard against all risk, a large number of Ward's cases had been previously prepared and filled with earth, and to these the seeds were immediately transferred. The first shipment was made in December, a few days after my arrival in Shanghae. Knowing that the vessels would probably arrive in America about the middle or end of March, I thought it likely the seeds would remain in the earth without vegetating during the voyage. Instead, therefore, of sowing the seeds near the surface in the usual manner, I mixed up large quantities with soil, and filled the case up with the mixture of earth and seeds. By this simple plan many thousands of seeds were carried to their destination, and when they arrived there were as sound as if they had been all the winter on a Chinese seed-bed. Of course it was necessary to unpack them immediately on arrival, and sow them thinly in other quarters. In the other cases which were shipped later, this mode of packing would not have been safe. The seeds were therefore sown thickly and covered with earth in the usual manner, and in this state might vegetate on the voyage without any risk whatever. In the one case the object was to get the seeds quickly to their destination without vegetating, for had this taken place the experiment would have been a failure; in the other they were placed in circumstances favourable for vegetation, and the only change likely to occur would be this, that in China they were only seeds, while towards the end of the voyage, or at its termination, they would have changed into healthy young plants.

"The watering, closing the cases, shipping, and last, but not least, securing the good-will of captain and officers, were all important operations."

Not only has the tea plant been thus introduced to the eastern states, but it has found its way also to the western; and our friends on both the Atlantic and Pacific sides are with their usual energy setting about growing it.

But there still remains the question whether they can turn it to profitable account. That their climate will be found to suit in some of the vast regions of the west there can be no reasonable doubt. But merely growing tea plants will not make commercial tea. The difficulty lies in the preparation of it, an operation which, as conducted

in China, demands an enormous quantity of labour—the article of which beyond all others the United States have the least to spare. But is it really necessary to prepare tea Chinese fashion?—to chop it up into little balls and twist it into all sorts of queer shapes, with all sorts of names, in order to give it its dietetical value? Surely not. We have ourselves found out that the painted article called green tea is not very wholesome, and by no means the better for the paint; and we quite anticipate that our United States friends will have even already projected some sort of machine that will produce good marketable tea without the assistance of human hands. This indeed, we know, is the opinion of Mr. Fortune himself.—*Gardeners' Chronicle*, 3rd *Dec.*, 1859.

---

## Notes on some Chinese plants recently introduced to England.

A large sale of Chinese plants took place at Mr. Stevens's rooms in the months of November and December of last year, and was noticed in the *Gardeners' Chronicle* at the time. The plants were introduced to England during my travels in China from 1854 to 1856, and had been carefully cultivated and propagated by Mr. Glendinning, of Chiswick Nursery, Turnham Green. As they are now distributed over the country, and as many of them are in the hands of amateurs as well as nurserymen and gardeners, a few notes on the habits of some of the most important, together with hints as to their management in Europe and America, may be useful. With this object in view I shall take them in the following order.

1. Camellias. "Princess Frederick William" and "Cup of Beauty."—These beautiful varieties were found cultivated in the gardens of Ningpo and Shanghae, where they are highly esteemed by all lovers of flowers. They are striped kinds: their flowers are very double, most perfect in form, and when the plants are a few years old both striped and self-coloured blossoms are produced upon the same specimen, giving it a striking and handsome appearance. This freak of nature is not unusual in the genus, but I am not aware that it exists in any known variety having flowers so perfect in form as either "Princess Frederick William" or "Cup of Beauty." Amongst many hundred kinds, both wild and cultivated, which came under my observation during my travels in China, these two with the fine double variety of *C reticulata* now in Mr. Standish's nursery at Bagshot, were the only ones which I considered worthy of introducing to English gardens. The "Yellow Camellia" introduced by me some

years ago is not attractive enough in its present state for our English taste, what it may become in the hands of our cultivators remains to be seen. The subjects of this notice require the same treatment as other varieties of the genus. The first named is a very free bloomer, and on this account will be particularly valuable.

2. Double-flowering Peaches, the "Camellia-flowered" and "Carnation-flowered."—These are very remarkable trees, and as they have proved perfectly hardy in England, they will one day produce a striking effect in our parks and pleasure grounds. They are common in the gardens of Northern China, where they attain to the size of our English almond. Nothing can be more beautiful than these when in full bloom. In the spring they are literally loaded with flowers as large as our Scotch roses. The "Carnation-flowered" has striped blooms resembling the carnation, hence its name, and like the Camellias already noticed, sports in a remarkable way, producing striped and self coloured flowers upon the same tree. Fancy a tree as large as the almond covered with flowers like the carnation on some branches, while on others the flowers are self-coloured (pink), and an idea may be formed of its striking beauty. These double Peaches seem to be particularly well adapted for forcing, as they form their flower-buds fully in autumn, and are ready to burst into bloom with the first warm days of spring. As spring flowers they are highly prized by the Chinese. Itinerant gardeners carry them about the streets for sale in the northern Chinese towns. The flower-buds are then just beginning to expand; the buyer puts his purchase in a pot, gives it a little water, and then places it in his window or sitting-room. In a day or two the buds burst and the little tree is one mass of bloom. They are propagated by budding and grafting, and will grow well in any common garden soil. I ought to add that small plants produce blossoms freely as well as large full-grown trees.

3. Prunus triloba.—This is a very fine bush or dwarf tree, said to come from the province of Shantung, in the north-east of China. It produces a profusion of semi-double rose-coloured flowers early in spring, and is quite a gem in its class. No doubt it is perfectly hardy in our climate. It will grow in any common garden soil, and is readily increased by budding or grafting. Like the double Peaches it can be easily forced into bloom for decorative purposes in spring.

4. Farfugium grande.—In these days, when plants with variegated foliage are so much in request, this is peculiarly valuable. It was found by me in the city of Ningpo, and said to have been brought from Pekin. As it has been exhibited at most of our horticultural

shows during the last three years, it is now well known in this country. I may remark, however, that the Chinese understand its treatment much better than we do, and consequently they have its leaves and variegation in greater perfection. They do not gorge it with rich food or grow it so rapidly. With them the footstalks of the leaves are shorter, the leaves smaller, but more firm and glossy, and the yellow spots more distinct and beautiful. It is hardy in England, but for decorative purposes is best when treated as a greenhouse or pit plant in winter and spring. During my travels in China last year I met with the plain-leaved variety (the original species) growing in damp woods under the shade of trees, and this accounts for the Chinese practice of growing Farfugium grande in shady situations during the hot months of the year. In China moderately rich loamy soil is considered the most suitable for its cultivation.

5. Chusan Palm.—This plant is common in the central and northern provinces of the Chinese Empire, where it is cultivated on account of the large quantity of strong and useful fibre formed on its stem at the base of the leafstalks. Its tropical-looking appearance has a curious effect in a landscape, not unlike our own, in so far as the vegetation is concerned. It has been in England since 1849, and is perfectly hardy in our climate, but grows slowly about London and to the northwards, which is partly owing to the want of that amount of summer heat experienced in its native country. Those who wish an effect to be produced in their gardens by its tropical-looking form, ought to grow it for a few years in a greenhouse, and when of sufficient size it may then be planted out in the open air. Some of the first importations are in the gardens at Kew, and there is a fine plant, perhaps the finest in Europe, in the Royal Gardens at Osborne, which was sent from China by me in 1849 to his Royal Highness the Prince Consort. Mr. Toward informs me that "it is about 10 feet high, the stem 2 feet 11 inches in circumference, perfect and uniform in its general outline, and allowed by all who have seen it to be the finest specimen in Europe."

6. Syringa oblata.—This is the Lilac of northern China. It grows to about the same height as our common English species, but is more tree-like in its form. As in England, so in China, there is a white variety of this species. Both are handsome ornamental trees—as handsome as our English Lilac, and equally hardy.

7. Quercus Bambusæfolia.—The fine evergreen Oak sold under this name was found wild on the mountains of the Chekiang province. Full-sized trees are from 30 to 50 feet in height, and are very

ornamental. It may interest entomologists to know that the beautiful and rare *Dicranocephalus Wallichii* was generally found on this species. This Oak is supposed to be hardy in England, and if so it will be a valuable introduction. It is probably distinct from the Hong-Kong species, which has been published under this name.

8. Chesnuts.—Two species of Chesnut were included in the sale at Stevens's, both forming trees of considerable size. One produces small fruit about the size and form of the hazel nut; the fruit of the other is larger, and by Europeans in the East considered of a finer quality than the Spanish Chesnut. Both kinds are cultivated extensively on the hill sides in the central and eastern provinces of China, and are quite suitable for the climate of this country.

9. Rhododendron Fortuni.—Very little is known about this plant, further than it was found amongst the mountains of the Chekiang province. It is probable, however, that it is a fine species, and quite distinct from any known in our gardens.

10. Taxus cuspidata.—The species was brought from Japan to Shanghae, and presented to me by the late Mr. Beale. I believe it is distinct from anything formerly introduced, and is, no doubt, perfectly hardy in our climate.

11. Abies Kæmpferi.—This fine tree, discovered amongst the mountains of Chekiang, has proved hardy in England, and is a very important introduction. A full description of it has already been given in the *Gardeners' Chronicle*. Its long, green, silky leaves when first unfolded in spring are singularly beautiful, and so they are again in the autumn, when they change with the ripening cones into a golden yellow colour; hence the name of "Golden Pine" which it is known by amongst the Chinese. It will be very rare in Europe for many years to come, owing to the difficulty of getting seeds to germinate after the long voyage. Knowing the importance of a tree of this kind, and that it was almost impossible to propagate it in this country, I used every means in my power to introduce its seeds in large quantities and in good condition. They were sent by the overland mail—some in letters through the Post Office, and others in small packages—for several years in succession, and were often sown in England in less than two months from the time they were gathered from the trees in China. Out of all sent home only one despatch vegetated freely, all the others were complete failures. All the plants of any size now in England were dug up in the woods of China, and sent home in Ward's cases. In cultivation this species, like many of its race, prefers a loamy soil, and a hilly or undulating situation. I would advise the

possessors of very small plants to keep them in shady places during the summer months. In nature the young plants are all reared under the shade of trees. Nothing can be worse for small plants of this kind, in small pots, to be alternately baked in the sun and deluged with water.

12. TORREYA GRANDIS.—This fine evergreen tree was discovered accidentally when on an expedition for seeds and plants of *Abies Kæmpferi.* Full-grown specimens met with were from 60 to 80 feet in height. It is perfectly hardy in England, and will grow in any common garden soil. In a young state it is not unlike the two species of *Cephalotaxus* formerly introduced from the same country, and now greatly admired in English gardens, but it is much more handsome than they are and attains a greater size. Its timber is valuable, and is used in the construction of gun-carriages? its seeds are used in medicine. It strikes readily from cuttings, but seedlings make the finest trees. Torreya grandis and Abies Kœmpferi are perhaps the most important of these introductions.———R. FORTUNE. *Gardener's Chronicle, 25th Feb.* 1860.

---

*(Wednesday, the 14th December 1859.)*

Dr. Thomas Thomson, President, in the Chair.

The proceedings of the last Meeting were read and confirmed, and the following gentlemen elected members:—

Lieutenant-Colonel John C. Guise; Lieutenant L. W. Wilmer; Lieutenant-Colonel E. W. Scott; Messrs. John N. Bullen and Patrick Smith.

The names of the following gentlemen were submitted as candidates for election:—

G. A. Burn, Esq., M. D. and A. M., 4th Cavalry Hyderabad Contingent,—proposed by the Secretary, seconded by Mr. W. G. Rose.

H. A. Hurst, Esq., Merchant, Calcutta,—proposed by Mr. James Cowell, seconded by Baboo Peary Chand Mittra.

James Smith, Esq., Nizamabad Factory, Azimghur,—proposed by Mr. C. F. Wintle, seconded by the Secretary.

Dr. Charles Wilson, Civil Surgeon, Roorkee,—proposed by Mr. C. A. Cantor, seconded by Dr. Thomas Thomson.

Edward James Lindsay, Esq., Merchant, Calcutta,—proposed by the Secretary, seconded by Mr. Rose.

Herschel Dear, Esq., Monghyr,—proposed by Mr. James Church, seconded by Mr. R. Blechynden.

William Anderson, Esq., Merchant, Calcutta,—proposed by Mr. W. G. Rose, seconded by Mr. C. B. Stewart.

Henry Edward Braddon, Esq., Merchant, Calcutta,—proposed by Mr. R. Blechynden, seconded by the Secretary.

The following contributions were announced:—

1. The Annals of Indian Administration, Part 3, Vol. 3. Presented by the Government of Bengal.

2. Madras Journal of Literature and Science, October and March 1858-59. Presented by the Madras Literary Society.

3. Memoirs of the Geological Survey of India, Vol. 1, part 3. Presented by Professor Oldham.

4. Journal of the Asiatic Society of Bengal, No. 4 of 1859. Presented by the Society.

5. Horticultural and Agricultural Repository. Presented by Capt. W. H. Lowther.

6. A collection of plants from Moulmein. Presented by M. Agabeg, Esq.

7. A small assortment of German flower seeds from Frankfort. Presented by G. Hoffmann, Esq.

8. A few grafts of English rose plants. Presented by J. Scott Elliot, Esq.

9. A collection of plants (chiefly roses) from the Royal Botanic Garden, Mauritius. Presented by the Superintendent, Mr. James Duncan.

10. A blanket dyed with the *Room* of Assam *(Ruellia indigotica)*, some Bootan Maize and Darjeeling Potatoes. Presented by Capt. Lowther.

11. Two samples of cotton and two of fibres from Koosma. Presented by Mr. P. Burke. The fibre is of an inferior description. The cotton was referred for report to the Committee.

12. A sample of cotton raised at Boolundshuhur from New Orleans seed. Presented by C. Currie, Esq.

The following is extract of Mr. Currie's note, dated 9th November :—

"As I am about to leave this district, I take the opportunity of sending you a specimen of the cotton grown from the New Orleans seed forwarded by you and obtained from the Agricultural Society. Of the six casks forwarded the seed of two only germinated, and that in very small quantities. I distributed the casks in different portions of the district, but the recipients have almost invariably reported that the seed did not germinate. I sowed about a beegah of land in my own compound, and the specimen of cotton now forwarded is a portion of the produce. The year has been unfavorable, there having been but very little rain; and I was obliged constantly to water the cotton field. Over the beegah enough plants germinated to have sufficed for half a beegah. The seed was sown in June, and the first yield of kapas was in September: since that date there has been a very fair yield every second day, and up to this time about a maund of kapas has been gathered. A few of the native landholders to whom I gave some of the seed are greatly taken up with the plant, and express their intention of cultivating it largely from the seed now produced. I intend taking the remainder with me to Lucknow, where I am now going, and will endeavor to get its cultivation tried in some of the districts in Oude. I regret that my sudden departure from the district has prevented my sending a fuller report on the result of the experiment. The specimen of cotton will be sent Dâk Banghy, and I shall be glad to hear the opinion formed of its quality by competent judges." (Referred to the Cotton Committee.)

## *Defaulters to the Society.*

The Council submitted for publication, in accordance with the rules, the names of the following members and ex-members as defaulters to the Society for arrears of subscription, *viz.*:—

Mr. H. Casperz, Captain J. C. Curtis, Mr. J. A. Loch, Mr. F. J. Marshall, Baboo Ramanath Banerjee, Rajah Jyemungul Singh, Baboo Juggoobundhoo Banerjee, and Mr. W. H. Kerrv.

The Council further submitted the following recommendation:—

That Section 5 of Chapter V. of the Bye Laws be altered as follows:—

Instead of the words "whose subscriptions are three quarters in arrear," the words "whose subscriptions are in arrear;" and instead of the words "four quarters in arrear," the words "more than one quarter in arrear."

The members present having assented to receive this recommendation, it was ordered to lie over for consideration at the next Meeting.

*Cultivated and Wild Silks.*

Three communications on the above subjects were submitted from Captain Hutton of Mussoorie, M. Perottet of Pondicherry, and Mr. Cope of Umritsur:—

1. From Captain Thomas Hutton, dated 21st November, reporting on certain eggs of the *Boro Pooloo*, or annual silk-worm of Bengal, forwarded to him by the Society in the early part of 1859.

"In answer to your inquiries made some months since regarding my opinion as to the healthiness of the eggs of your Bengal annual silk-worm, the Boro Pooloo, I have now the pleasure to lay before you the result of my investigations.

"On the 27th and 28th of March 1859, I received from you two papers covered with the eggs of the above species, and stated by you to have been deposited on the 21st and 22nd of that month. These eggs I perceived at a glance to be diseased, there being among some good ones many that were of a vinous red, and others dull green. Subsequently you likewise sent me a piece of cloth thickly covered with similarly discolored eggs, said to have been deposited at Moorshedabad. [These were received from Count Freschi.]

"On the 1st September 1859, these eggs began to hatch, thus corroborating my previous statements, that in the climate of Mussooree the species yielded two crops annually instead of one. Instead, however, of all hatching together, as the previous batch of healthy eggs had done, a few worms only appeared, daily increasing in numbers up to the present date, and trying my patience by their irregularity.

*The following List will show you how troublesome they have been:—*

| Eggs laid on 21st and 22nd March. | | Eggs from Moorshedabad. | Therm. | Total. |
|---|---|---|---|---|
| 1 Sept. | 2 | 1 | | 3 |
| 4 „ | 1 | 1 | | 2 |
| 5 „ | 1 | 0 | | 1 |
| 7 „ | 1 | 0 | | 2 |

| Eggs laid on 21st and 22nd March. | | Eggs from Moorshedabad. | Therm. | Total. |
|---|---|---|---|---|
| 10 Sept. | 2 | 0 | | 2 |
| 11 „ | 4 | 0 | | 4 |
| 13 „ | 2 | 0 | | 2 |
| 14 „ | 2 | 0 | | 2 |
| 15 „ | 5 | 0 | | 5 |
| 16 „ | 4 | 0 | | 4 |
| 17 „ | 2 | 0 | | 2 |
| 18 „ | 6 | 2 | | 8 |
| 19 „ | 2 | 1 | | 3 |
| 20 „ | 6 | 1 | | 7 |
| 21 „ | 9 | 1 | | 10 |
| 22 „ | 12 | 0 | | 12 |
| 23 „ | 23 | 0 | | 23 |
| 24 „ | 5 | 0 | | 5 |
| 25 „ | 22 | 2 | | 24 |
| 26 „ | 21 | 1 | | 22 |
| 27 „ | 26 | 2 | | 28 |
| 28 „ | 18 | 1 | 63· wind rain. | 19 |
| 29 „ | 19 | 0 | Ditto | 19 |
| 30 „ | 27 | 0 | | 27 |
| 1 Oct. | 58 | 2 | | 60 |
| 2 „ | 38 | 1 | 68· fine. | 36 |
| 3 „ | 41 | 3 | 68· „ | 44 |
| 4 „ | 41 | 4 | 70· | 54 |
| 5 „ | 52 | 6 | 69· | 58 |
| 6 „ | 56 | 1 | Damp 68· cold. | 57 |
| 7 „ | 52 | 3 | 67· | 55 |
| 8 „ | 61 | 3 | 68· | 64 |
| 9 „ | 61 | 9 | 68· | 70 |
| 10 „ | 57 | 11 | 68· | 68 |
| 11 „ | 42 | 10 | 68· to 70· | 52 |
| 12 „ | 57 | 6 | 68· | 63 |
| 13 „ | 51 | 9 | 68· | 60 |
| 14 „ | 49 | 8 | 68· | 57 |
| 15 „ | 66 | 9 | 67· | 75 |
| 16 „ | 70 | 10 | 67· | 80 |
| 17 „ | 62 | 12 | 66· | 74 |
| 18 „ | 65 | 23 | 66· | 88 |

| Eggs laid on 21st and 22nd March. | | Eggs from Moorshedabad. | Therm. | Total. |
|---|---|---|---|---|
| 19 Oct. | 92 | 8 | 66· | 100 |
| 20 „ | 71 | 17 | 65· | 88 |
| 21 „ | 87 | 27 | 66· | 114 |
| 22 „ | 68 | 21 | 66· | 89 |
| 23 „ | 73 | 25 | 65· | 98 |
| 24 „ | 81 | 26 | 64· | 107 |
| 25 „ | 61 | 14 | 63· | 75 |
| 26 „ | 60 | 24 | 62· | 84 |
| 27 „ | 51 | 25 | 61· | 76 |
| 28 „ | 74 | 28 | 66· | 102 |
| 29 „ | 69 | 36 | 64· in air 50· | 105 |
| 30 „ | 75 | 27 | 63· | 102 |
| 31 „ | 73 | 31 | 64· | 104 |
| 1 Nov. | 53 | 36 | 64· | 89 |
| 2 „ | 60 | 32 | 64· | 92 |
| 3 „ | 60 | 36 | 64· | 96 |
| 4 „ | 82 | 39 | cloudy 64· | 121 |
| 5 „ | 72 | 43 | 63· | 115 |
| 6 „ | 72 | 47 | 63· | 119 |
| 7 „ | 93 | 68 | 63· | 161 |
| 8 „ | 92 | 58 | 64· | 150 |
| 9 „ | 78 | 77 | 64· | 155 |
| 10 „ | 77 | 78 | 63· | 155 |
| 11 „ | 73 | 60 | 63· | 133 |
| 12 „ | 83 | 56 | 64· | 139 |
| 13 „ | 59 | 60 | 65· | 119 |
| 14 „ | 63 | 75 | 64· | 138 |
| 15 „ | 70 | 76 | 64· | 146 |
| 16 „ | 76 | 96 | 64· | 172 |
| 17 „ | 77 | 82 | 64· | 159 |
| 18 „ | 16 | 9 | Exposed all night in open air to check hatching. 48· at sunrise, with hoar frost. | 25 |
| 19 „ | 62 | 88 | 60· | 150 |
| 20 „ | 64 | 98 | 60· | 162 |
| 21 „ | 54 | 88 | 60· | 142 |

There are still many of the Moorshedabad eggs to hatch, but very few of the others, and I suppose they will continue to hatch in the same troublesome manner; leaves, however, are growing scarce, and I must allow the younger worms to perish as useless.

This irregularity in hatching is followed by a similar irregularity in moulting, and those which were hatched on the same day did not all moult together, thus rendering the trouble of attending to them doubly great.

Then again in the spinning, and, lastly, in the exclusion of the moth from the cocoon, the same irregularity occurs, and I fear that very few healthy eggs will be obtained. Sometimes one moth appears, and then again for several days none at all.

"The spinning began on the 6th October, and still continues, and the first moth emerged on the 25th October, and up to the 11th November only *one male* appeared to 12 females; on the 12th November also one male; on 15th November one male; 16th November 1 male, 1 female; 17th November 1 female; 18th November 1 male; 19th November 1 female; 21st November 1 male. You may imagine, therefore, that very few eggs have been obtained. In regard now to the caterpillars, there is no perceptible difference between those that are hatched from the slate grey eggs, and those from the green and reddish eggs. After the second moult one will occasionally turn quite green, like the damp yellowish green stains on an old wall; and the color even of the healthiest is not natural. Worms from the green eggs set apart only produced *one* green worm; those from the red and those from the grey eggs were in all respects alike. Some of the cocoons are white and well formed, others white and small; many are pale golden, and some faint green: these last are not confined to the green worms. In short, one and all are equally unhealthy.

"Most of the cocoons are small and misshapen, and a few only are of tolerable size: that disease is present is shown in the discoloration of the eggs, in the irregularity of hatching, moulting, spinning, color of caterpillars, and hatching of the moths. The egg-shell of the dark grey eggs is white after the worm is hatched, but those of the green eggs is *yellow!*

"On the 18th November, being tired of attending to so troublesome a brood, I placed the eggs out in the open air at night for the purpose of checking the hatching: in the morning the ground was covered with hoar frost, and the thermometer at sunrise indicated only 48°.

"Yet notwithstanding this 25 worms were hatched; the smallness of the number, however, as compared with other days, made me think that I had put an end to the brood by the sudden change of temperature, and, consequently, the papers were re-placed in the rearing-room with a tem-

perature of 60°. Judge of my surprise then, on the following morning, to find that the exposure had no effect upon the eggs, and that 150 worms were hatched on the 19th, 162 on the 20th, and 142 on the 21st. I shall now let them hatch as they are useless from sickness, and I shall soon have no food for them, so that they must die.

"I hold this species to be distinct from the Cashmere worm, and shall give you my reasons for so thinking at another time."

2. From M. Perottet, dated 26th October, offering, in reply to enquiries, some observations respecting certain wild *Bombyces* which are met with at Pondicherry.

No. 3. From H. Cope, Esq., dated 22nd November, with some strips of the Tusser cocoon:—

"I do myself the pleasure to enclose strips of the Tusser cocoon, ready cut by the people of the hills, who, as well as those of the plains adjoining, use them on account of their extreme tenacity, to bind the barrels of their matchlocks to the stock. I received these from Mr. Reginald Saunders, who is doing all that can be done in enquiring into the produce of his valuable district. He says these strips are considered by the natives, who use them, tougher and more durable than brass rings."

*Branch Agri-Horticultural Society of Balasore.*

Read a letter from Dr. A. A. Mantell, Secretary, submitting the following annual report of the proceedings of the above Society ending 31st October 1859:—

*Foundation and object.*—The Branch Agricultural and Horticultural Society which was established on the 1st of November 1858, with the two-fold object of commemorating the auspicious day on which Her Majesty Queen Victoria assumed the direct sovereignty of India, and of promoting the successful growth of crops in the district of Balasore, has not been so successful as could have been desired.

*Sugar Canes.*—The supply of 1,000 Sugar Canes, which was received from the Calcutta Society, was distributed to a large number of chasees and others. All have failed, but three canes, which were amongst a batch distributed by the Deputy Collector of the Sub-Division Bhuddruck to twenty-two villages in his district, and which canes he says "promised to be of a superior description."

*Cotton.*—A large quantity of Orleans Gulf Petit Mexican cotton seed, kindly placed at the disposal of the Society by the Calcutta Chamber of Commerce, have entirely failed, but this failure is undoubtedly due to the seeds being old and useless before the Branch Society received them.

*Tobacco.*—A quantity of Tobacco seed was received too late for planting.

*Potatoes.*—A few Potatoes were distributed for planting, but the reports are unfavorable. This is not to be wondered at, as they appear only to have been sown in sandy soil.

*Difficulties encountered by the Society.*—The Branch Society have a most ignorant and lazy class of people to deal with, and nothing at present will induce them to believe that the object of the Society is entirely for their good; there is, however, little doubt that if good samples could be once shown them as having been grown on the spot, the better class would willingly substitute good seed for their present inferior description.

*Garden proposed.*—The result of the distribution and cultivation of these sugar canes, cotton seed, &c., have been of so unsatisfactory a nature, that the Society have resolved to give up for the present the idea of inducing the people of this district to cultivate seed, &c., supplied to them, and at their last meeting proposed that a garden for agricultural and horticultural purposes should be at once established, and that the Society's whole attention should be directed to the growth of field and garden products, to samples of which the attention of the cultivators could be drawn by them.

*Selection of ground.*—For the above object the Society have selected a piece of ground, originally a part of the "Lines," and have applied to Government for permission to convert it into a garden. They propose to commence by enclosing and manuring a small portion (5 beegahs) of such land, and when it is in tolerable order, they will engage the services of a good malee from Calcutta to direct the subsequent operations.

*Finances.*—The Finances of the Branch Society are at present sufficiently good to enable them to carry out the above plan on a small scale, and they feel certain of success, provided they have the hearty co-operation of all the Local Members, and a continuance of that support of the Parent Society in Calcutta which has hitherto been so kindly given.

A. A. MANTELL, M. D.,
*Honorary Secretary B. A. Society.*

*Balasore, November* 1859.

*Communications on various subjects.*

The following papers were also submitted :—

1. From Capt. W. H. Lowther, observations on the mischievous increase of a gigantic species of *Solanum* on the N. E. Frontier of Bengal (Referred to the Committee of Papers).

2. From H. Cope, Esq., a few more particulars regarding the hemp plant of the Punjab :—

"I have received Mr. Stalkartt's report on the samples of Kangra hemp, the produce of the CANNABIS *sativa*, and am obliged for the same. I omitted to note that I forwarded to you in October 1856 a sample of this very hemp, as the produce of CANNABIS *sativa* (see *Journal Agri-Horticultural Society, Vol. X., page* 96), and that Mr. Stalkartt then considered it good, and wished to see more of it in bulk.

"At a meeting of the Chamber of Commerce of Dundee, held on the 28th September last, Mr. Sturrock, the Secretary, said, the sample sent home had not been properly prepared, and it was therefore difficult to test it; and in this he agrees with Mr. Stalkartt. He adds:—'A portion has been, however, made into rope and twine as now exhibited; and the maker reports, this hemp would be very useful to the trade, *possessing great strength*, and for cordage would compete successfully with St. Petersburg hemp.' Mr. O. G. Miller stated that since that report was written, some additional experiments had been made on the hemp. 'He now submitted these samples, which he had only got from Messrs. Charles Norris and Sons that day. It was prepared by some chemical process, and made the fibre very soft and clean. The waste in preparing it was only about 10 per cent. This was a very small percentage.'

"It is, therefore, beyond a doubt that this hemp is of considerable value. I showed the samples of the stem sent me by Mr. R. Saunders, and described in my previous communication, to Sirdar Runjor Singh Majeeteea, the Chief who commanded at the battle of Alliwal. He informed me that the hemp plant in Mundu was ordinarily of the same length, but that grown in Kooloo, of which he was once Governor, was much taller, attaining so great a height as to reach an elephant and his rider standing up (from 14 to 15 feet). I know also that in Kashmeer it attains a great height, and is stowed away in the houses to be stripped during the long winter nights. From this fact I infer that it is not retted in Kashmeer. The product is certainly an important one, and I hope to give you further information regarding it."

3. From Under-Secretary, Government of Bengal, dated 2nd December, submitting a communication from the Commissioner of Chittagong, in continuation of his former letter [which was noticed in the Proceedings for August 1858], respecting the fruiting of the Hill Bamboo.

4. From H. Cope, Esq., dated 19th November, giving the results of certain experiments with the view of extending the period of produce of English vegetables:—

"It may be encouraging to those who are anxious to extend the period during which English vegetables are now obtainable in the North-West

of India, to learn that I have succeeded by early sowing in pots, and keeping the plants in the shade till strong enough to bear transplanting, and a better care as to shade after that operation, in obtaining excellent drumhead cabbages. I have now turnips and carrots ready for the table; my beet has been exhausted for nearly a month, not having had seed enough to keep up a succession; and I hope to see cauliflowers in bloom in the course of a few days. I saw it noticed that peas were gathered several days ago in a garden at Lahore, and I entertain no doubt that with care and attention we might put English vegetables of almost every kind on our tables from the 1st of October to the beginning of May."

5. From Thomas Oldham, Esq., Superintendent, Geological Survey of India, returning thanks for a copy of the Society's Journal, Vol. X., Part 3.

6. From John E. Amory, Esq., United States Vice-Consul General, conveying his acknowledgments for a complete set of the Society's *Transactions* for the agricultural division of the Patent Office of the United States, and promising to reciprocate.

The Secretary having announced the recent receipt, per *Ida Zeigler*, of the large collection of field crop seeds, which was forwarded by Messrs. James Carter and Co. in April last, it was agreed, the season being so far advanced, to distribute such few kinds only as are likely to succeed as late crops, and to reserve the remainder, carefully secured in their original tin-lined boxes, for distribution in the early part of the next season.

For all the foregoing presentations and communications the best thanks of the Society were accorded.

A. H. BLECHYNDEN,

*Secretary.*

# REPORT

OF THE

# Agricultural and Horticultural Society

# OF INDIA.

*Report from the Council to the Annual General Meeting of the 11th January,* 1860.

The Council have the pleasure, in submitting their usual Annual Report, to congratulate the Society on the large number of elections during the past year, and on the decrease in the number of deaths and resignations as compared with 1858. The number of members added to the list has been 118, which is more than in any previous 12 months during the last 20 years, except in 1851, when the elections aggregated 122.

The following tabular statement affords the necessary details as respects the constitution of the Society:—

| Classification. | In 25 previous years. | In 1846. | In 1847. | In 1848. | In 1849. | In 1850. | In 1851. | In 1852. | In 1853. | In 1854. | In 1855. | In 1856. | In 1857. | In 1858. | In 1859. | Gross Total. | Total real number at close of 1859, after deducting lapses. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Honorary Members, .. .. .. | 11 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 1 | 18 | 11 |
| Associate Members, .. .. .. | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 |
| Corresponding Members, .. .. | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 4 |
| Civilians, .. .. .. .. | 232 | 13 | 15 | 22 | 8 | 10 | 22 | 16 | 18 | 6 | 23 | 23 | 17 | 19 | 28 | 472 | 183 |
| Merchants and Traders, .. .. | 201 | 14 | 12 | 13 | 10 | 14 | 20 | 12 | 5 | 16 | 18 | 31 | 11 | 20 | 15 | 412 | 141 |
| Indigo and other Tropical Agriculturists, .. .. .. | 190 | 15 | 6 | 5 | 1 | 9 | 19 | 13 | 10 | 7 | 14 | 12 | 10 | 14 | 20 | 345 | 119 |
| Military Officers, .. .. .. | 160 | 10 | 11 | 11 | 11 | 9 | 34 | 18 | 22 | 19 | 26 | 22 | 12 | 14 | 27 | 406 | 145 |
| Medical Officers, .. .. .. | 80 | 0 | 2 | 3 | 5 | 7 | 4 | 5 | 3 | 4 | 6 | 9 | 3 | 3 | 16 | 150 | 43 |
| Asiatics, .. .. .. .. | 63 | 2 | 14 | 5 | 6 | 9 | 8 | 8 | 8 | 5 | 5 | 7 | 14 | 19 | 4 | 177 | 68 |
| Clergy, .. .. .. .. | 14 | 1 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 0 | 0 | 26 | 8 |
| Law Officers, .. .. .. | 40 | 1 | 0 | 0 | 6 | 4 | 6 | 3 | 1 | 3 | 6 | 2 | 1 | 5 | 2 | 80 | 25 |
| Miscellaneous, .. .. .. | 9 | 0 | 2 | 0 | 2 | 2 | 6 | 0 | 0 | 10 | 0 | 0 | 2 | 7 | 5 | 45 | 31 |
| | 1,002 | 58 | 62 | 60 | 49 | 67 | 122 | 78 | 69 | 72 | 100 | 109 | 72 | 102 | 118 | 2,140 | 780 |

The lapses alluded to in the last column comprise 14 deaths,* 24 resignations, and 13 whose names have been taken off the list, their subscriptions being irrecoverable, amounting in all to 51.

Of the total number (780) introduced in the last column, 33 have compounded for their subscriptions, 118 are absent from India, and 17 are Honorary, Associate, and Corresponding; in all 178: leaving 612 as the actual number of paying members at the close of the year, or an increase of 54 on the year 1858.

In the early part of the year Sir Arthur Buller having vacated the Presidential chair in consequence of his departure from India, was unanimousely elected an Honorary Member in recognition of his services during the period in which he had held that office.

On the subject of finance the Council are also able to report favorably. The total receipts during the year, including the cash balance at the close of 1858, amount to Rs. 32,714-1, and the disbursements during the same period to Rs. 31,446-5-10, leaving a balance in the Bank of Bengal, and with the Secretary, of Rs. 1,267-11-2. The Vested Fund remains the same, namely Rs. 20,333-5-4. The liabilities of the Society amount to Rs. 11,050, and the dependencies to Rs. 8,658-2-9, after deducting the sum of Rs. 2,165-6-9, as assumed irrecoverable subscriptions from deceased members, and from others whose names have been removed from the list. This appears a large sum, but as no deduction was made in 1858, it may be classed under the head of profit and loss for two years.

The usual exhibitions have been held during the year in the Auckland Garden and Town Hall in the months of January, February, and March. They were, altogether, equally as good as those of the three previous years, except that, in the floricultural

* Lieut.-Col. L. H. Smith; Rajah Jogender Chunder Roy; Messrs. Wallace Wilmot, Frederick Maclagan, E. H. Longden, Wells Butler, C. S., and A. Brousmichie; Baboo Joygopaul Mullick; Brigadier J. Mackenzie; Messrs. J. Marquiz, F. Courjon, R. C. St. George, W. T. Denman, and S. W. Bradbury.

department, the display of orchids was rather scant. The amount distributed in prizes was Rs. 1,054.

The importations of vegetable and flower seeds have, altogether, proved satisfactory, scarcely any kinds failing to germinate, and the general average percentage being 52 of the consignment from the Cape, and 45 of the consignment from America. After careful trials made in the Botanic Garden they have been considered equal in quality to receipts of former years. The consignment of field crop seeds from Messrs. James Carter and Co., did not, unfortunately, reach before November, far too late in the season for general distribution; it has therefore been reserved for distribution next year. The consignment was shipped in April, and would most probably have arrived in July, had not the "*Ida Ziegler*," the vessel by which it was forwarded, been obliged to put into Rio de Janeiro for repairs. Despatches of vegetable seeds have been sent to various parts of the country for the benefit of Soldier's gardens, and a large and varied collection of all kinds of seeds to Port Blair in the Andaman Islands.

Besides the above usual consignments, other kinds of seeds have been received during the year; among them may be noticed the Pernambuco cotton seed and madder seed, the former, through the kind instrumentality of Mr. Stewart Douglas, the latter through Mr. James Cowell. The cotton seed has only partially succeeded, while the madder seed has totally failed. Steps have been taken to procure another supply of the latter.

The distribution of plants during 1859, has been tolerably large, though not equal to the previous year. Rather more than ten thousand have been sent out from the garden, including 3,700 fruit grafts, and small supplies of coffee and vanilla. In addition to these, nearly three thousand sugar canes, and a large quantity of useful bulbs. such as arrow-root, tapioca, and yams of sorts, have been distributed; also 29 glazed cases of useful and ornamental plants. The number of applicants during the year have been 168.

It was deemed necessary in the early part of the year to increase the rate of the wages of laborers employed in the garden from

4 rupees to 4-8 per mensem, and at the close of the year to add ten additional hands to the fixed establishment, instead of engaging extra men at different periods. This step will scarcely involve any additional expence, while it may tend to secure labor at all times.

The Society is indebted to Mr. Fortune for a supply of plants and seeds from China received in April last; several of the former are thriving well in the garden, and others with seeds, have been distributed.

It was mentioned in the last report that there had been no demand for the Chinese green dye plants, of which the Society had a large stock on hand During the past year, it is gratifying to observe, all these plants (173 in number) have been distributed, and several applications registered for a portion of the next available supply, which may be expected to be ready about the commencement of the rains.

It may here be added, by way of record, that Mr. McMeekin, the Gardener selected by the Right Honorable Sir Lawrence Peel, arrived in June, and took charge of the garden from Mr. Manuel, the Officiating Gardener, on the 1st September.

The subject of flax cultivation has much engaged the attention of the Society during the past 12 months, in connection with the Dundee Chamber of Commerce. At the meeting in March a report of a Special Committee was submitted in reference to the best practicable mode of promoting the growth of the staple in India, and a copy was furnished to the Dundee Chamber for their information and guidance; the Society has not yet received any acknowledgment of it: the report was published *in extenso* in the proceedings for March. Several other communications have been laid before the Society on this important subject, including an interesting paper from the Government of the Punjab, respecting the sale in the English market of flax raised in that province, which will be found in the recently published number of the *Journal.*

The Society has also been in communication with the Manchester Cotton Supply Association, respecting the cultivation of this important staple, and the best means of cleaning it. They have indented

on the Association for sets of the "Cottage Saw Gin," or any other cheap and effective machines that may be available, with the view of bringing them into notice on this side of India. Some other papers on cotton culture have likewise been submitted, with samples of produce, but the experiments have not been conducted on a sufficiently extended scale to merit a special notice in this report.

The interesting subject of silk—both cultivated and wild—has been introduced at nearly every meeting during the year. The Society are indebted to Count Freschi, Capt. Hutton, Mr. Cope, Monsr. Perottet and Mr Pringle, for various communications thereon, which it is to be hoped may tend to elicit still further information, more especially in respect to the wild silk yielders of India, regarding which our information is still so scanty and imperfect.

The Government of India it may be mentioned, has again communicated with the Society respecting the introduction of the Quinine yielding Cinchonas into India. Her Majesty's Government, it would appear, have deputed a confidential Officer to South America, to make a collection of seeds and plants, and convey them to Calcutta, Madras, and Ceylon. The Society have responded to the best of their ability, though not in a position to offer any information based on practical experience, to the request preferred by Government in respect to the localities best suited for their introduction, with hints to aid in the cultivation of these valuable species in India.

The Council desire to introduce in this report, by way of record, that during the past year they proposed to the Trustees of the Dalhousie Testimonial Fund, that the large surplus balance at credit of that Fund, be appropriated to the purchase and improvement of a piece of ground in the suburbs of Calcutta for the establishment of a Public Garden and Park; to be called the "*Dalhousie Park,*" the Society's Garden being incorporated with it; the Society undertaking the management and applying a certain portion of its funds towards improving it. The proposal has not been assented to, the amount having been transferred to the "*Dalhousie Institute.*"

The Council have, finally, to report, that during the past year two numbers of the Journal have been published,—Part 3 of Vol. X, and Part 1 of Vol. XI,—both containing several interesting papers, including notes on the Indigenous Plants of Bengal; a Prize Essay on the cultivation of the Date tree and manufacture of its juice into sugar; a translation of Mons. Rondot's treatise on the Green dye of China and Green dyeing of the Chinese; also notes on the Silkworms of India, and on the introduction of Flax, as a fibre-yielding plant, into India.

*Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December, 1859.*

RECEIPTS.

| | | |
|---|---|---|
| From Members, Subscriptions collected during the year, ... ... | Co.'s Rs. | 18,723 1 3 |
| ,, Government Annual Donation, .. ... ... ... ... | 5,000 0 0 | |
| ,, The Right Honorable Lord Canning's annual donation for the year 1859, .. ... ... ... ... ... ... | 500 0 0 | |
| | | 5,500 0 0 |
| ,, Accruings of interest on Government Notes, ... ... ... ... ... | | 813 5 4 |
| ,, Proceeds of Sugar-cane delivered from the Nursery Garden, | 167 12 0 | |
| ,, Ditto, fruit grafts delivered from the Nursery Garden, ... | 762 5 9 | |
| ,, Ditto, arrowroot delivered from the Nursery Garden, ... | 25 0 0 | |
| ,, Ditto, Orchids delivered from the Nursery Garden, ... ... | 21 4 0 | |
| ,, Ditto, of a proportion of surplus Cape American and Scotch vegetable and English flower seeds of 1858-59, ... ... | 2,409 14 6 | |
| ,, Ditto, of English vegetable seeds, ... ... ... ... | 60 0 0 | |
| ,, Ditto, of Jute seed, ... ... ... ... ... ... ... | 3 4 0 | |
| ,, Ditto, of Copies of *Journal of the Society*, ... ... ... | 124 6 0 | |
| ,, Ditto, of ,, of *Transactions of the Society*, ... ... | 36 0 0 | |
| ,, Ditto, of ,, of *Indian Agricultural Miscellany*, ... | 5 0 0 | |
| ,, Ditto, of a Copy of *Fenwick's Hand-Book of Gardening*, .. | 2 0 0 | |
| ,, Ditto, of sale of old seed boxes, .. ... ... ... .. | 4 0 0 | |
| ,, Amount for rope and baskets refunded by Mr. McMeekin, | 7 0 0 | |
| ,, Members, amount for pots, and packing charges for seeds, &c., ... ... ... ... ... ... ... ... ... | 693 11 0 | |
| ,, Ditto, amount for glazed cases, &c., ... ... ... ... | 174 8 0 | |
| ,, Ditto, amount repaid for freight on boxes of seeds forwarded in 1858-59, ... ... .. ... ... ... ... | 192 1 3 | |
| | | 4,688 2 6 |
| ,, John Cochrane, Esq. Official Assignee, being the seventh dividend on the Society's claim of Co.'s Rs. 73-5-2 against the estate of Messrs. Saunders, May, Fordyce and Co., ... | | 0 10 9 |
| Total Receipts, Co.'s Rs., ... | | 29,725 3 10 |
| By Balance in the Bank of Bengal on 31st December, 1858, ... | 2,973 2 2 | |
| ,, ditto in the hands of the Secretary on ditto, ... ... ... | 15 11 0 | |
| | | 2,988 13 2 |
| Grand Total, Co.'s Rs., ... | | 32,714 1 0 |

DISBURSEMENTS.

| | | |
|---|---|---|
| By Messrs. C. M. Villet & Son for Cape vegetable seeds supplied in 1859, ... ... .. ... ... ... ... ... | 2,437 0 0 | |
| ,, Messrs D. Landreth and Son in part for American vegetable seeds, supplied in 1857-58, ... ... .. ... ... | 4,020 6 3 | |
| ,, Messrs James Carter and Co. in full of their bills, amounting to £235 6-4 for English flower seeds, &c., supplied in 1858, | 2,340 15 6 | |
| | | 8,798 5 9 |
| Carried over, Co.'s Rs., ... | | 8,798 5 9 |

| | Rs. | As. | P. | Rs. | As. | P. |
|---|---|---|---|---|---|---|
| Brought forward, Co.'s Rs. ... | 8,798 | 5 | 9 | | | |
| By Messrs. Carlisle, Nephews and Co. for 23 bags of Pernambuco Cotton seed, ... | 264 | 13 | 3 | | | |
| ,, James Cowell, Esq., for Madder seed, ... | 35 | 0 | 0 | | | |
| ,, Additional packets of Cape and English flower seeds, .. ... | 74 | 12 | 0 | | | |
| | | | | 9,172 | 15 | 0 |
| **Library.** | | | | | | |
| ,, Books purchased during the year for the Library, ... | 436 | 9 | 0 | | | |
| ,, Binding books during the year, ... | 29 | 0 | 0 | | | |
| | | | | 465 | 9 | 0 |
| **Cocoons.** | | | | | | |
| ,, Mr. Hill for Tussur Cocoons sent to Government of India for transmission to Government of Bombay, ... | | | | 3 | 0 | 0 |
| **Printing.** | | | | | | |
| ,, Sundry parties for printing receipts and schedule of prizes for flower shows, &c., &c., ... | | | | 50 | 8 | 0 |
| **Journal.** | | | | | | |
| ,, Bishop's College Press, for printing, &c., 700 copies of *Journal* Parts 2 and 3, Vol 10 of the A. and H. Society, including *Proceedings of Society*, ... | | | | 1,076 | 15 | 0 |
| **Nursery Garden.** | | | | | | |
| ,, Ordinary expences incurred on account of the Nursery Garden from 1st December, 1858, to 30th November, 1859, .. | 4,296 | 4 | 3 | | | |
| ,, Extra ditto, for purchase of fruit seedlings for grafting, for glazed cases, pots, for widening and repairing roads, for thoroughly repairing old conservatory, for building a new one, for Gardener's Bungalow, and for sundry other contingent expences, ... | 2,252 | 15 | 9 | | | |
| ,, Messrs. G. F. Lackersteen and Co. for 1 cart, &c., &c., ... | 159 | 4 | 3 | | | |
| ,, J. M. Agabeg, Esq., for earth oil, &c., for Garden conservatory, &c., ... | 94 | 0 | 0 | | | |
| ,, R. Fortune, Esq., being the expences attendant on the purchase and despatch of plants and seeds from China, .. ... | 311 | 3 | 4 | | | |
| | | | | 7,113 | 11 | 7 |
| **Establishment.** | | | | | | |
| ,, Amount for establishment from 1st December, 1858, to 30th November, 1859, ... | | | | 8,748 | 6 | 0 |
| **Machinery.** | | | | | | |
| ,, Secretary Agricultural and Horticultural Society, Punjab, for a flax cleaning machine, ... | | | | 55 | 0 | 0 |
| **Pecuniary Rewards.** | | | | | | |
| ,, Prizes to Mallees for vegetables and fruits at exhibitions held on the 19th January, and 24th February, and 31st March, 1859. | 740 | 0 | 0 | | | |
| ,, Ditto to ditto, for flowers at ditto, on, ditto, ditto, ditto, ... | 314 | 0 | 0 | | | |
| ,, Horreemohun Mookerjee for Bengalee Agricultural work (*Krishi Durpun*,) ... | 50 | 0 | 0 | | | |
| | | | | 1,104 | 0 | 0 |
| **Advertisements.** | | | | | | |
| ,, Advertising notices of general meetings, of shows of vegetables and flowers, distribution of seeds, ... | | | | 265 | 15 | 9 |
| Carried over, Co.'s Rs. ... | | | | 28,056 | 0 | 10 |

| | | |
|---|---|---|
| **Stationery.** | | |
| Brought forward, Co.'s Rs., ... | | 28,056 0 10 |
| By stationery for office books, &c., for the use of the office, ... | 72 14 0 | |
| ,, brown packing paper for packing seeds, ... ... ... ... | 26 0 0 | |
| | | 98 14 0 |
| **Freight.** | | |
| ,, Freight on boxes of seeds, books, &c., sent and received from the Cape of Good Hope, America, &c., ... ... ... ... ... ... | | 394 5 9 |
| **Metcalfe Hall.** | | |
| ,, Society's proportion of assessment on the Metcalfe Hall from October, 1858, to September, 1859, ... ... ... ... | 157 8 0 | |
| ,, Ditto of ditto for lighting tax from ditto to ditto,... ... ... | 42 0 0 | |
| ,, Modosuden Roy for Society's proportion for inspecting and looking over the Metcalf Hall Building from April, 1858, to March, 1859, ... ... ... ... ... ... ... | 20 0 0 | |
| | | 219 8 0 |
| **Customs' Duty.** | | |
| ,, Government Custom's Duty for American and Cape vegetable and English flower seeds, &c., ... ... .. ... ... ... ... | | 835 11 3 |
| **Furniture.** | | |
| ,, sundry articles of furniture, ... ... ... ... ... ... ... ... | | 65 0 0 |
| **Prize Essay.** | | |
| ,, Mr. S. H. Robinson for *Prize Essay on Date Tree,* ... ... ... ... | | 500 0 0 |
| **Medal.** | | |
| ,, Messrs. Charles Nephews and Co. for a Silver Medal, and engraving Inscription in Persian, ... ... ... ... ... ... | | 22 0 0 |
| **Petty Charges.** | | |
| ,, Sundry charges, including postage on letters, &c., sent and received, and for copies of the *Journal*, ... ... ... | 676 7 3 | |
| ,, Extra writer and packermen for sub-dividing seeds, and writing on papers, ... ... ... ... ... ... ... ... | 54 0 0 | |
| ,, Soldering tin boxes and lining wooden boxes with tin, sent to Non-Resident Members, ... ... ... ... ... ... | 40 4 6 | |
| ,, Expenses incurred in putting up a fence round a portion of the Auckland Circus, &c , and superintending the erection of tents for flower and vegetable shows for the season, ... | 215 7 0 | |
| ,, Presents to Constables for attending at Horticultural and Floricultural Exhibitions during the year, ... ... ... | 80 0 0 | |
| ,, Messrs. Grindlay and Co., being balance due to them as per account dated 31st May, 1859, ... ... ... ... ... | 181 10 9 | |
| ,, Secretary Bank of Bengal for renewing notes, and for fees and commission, ... ... ... ... ... ... ... ... | 7 0 6 | |
| | | 1,254 14 0 |
| Total Disbursements, Co.'s Rs., ... | | 31,446 5 10 |
| By Balance in the Bank of Bengal on 31st December, 1859, ... | 1,253 7 5 | |
| ,, Ditto in the hands of the Secretary on ditto, ... ... ... | 14 3 9 | |
| | | 1,267 11 2 |
| Grand Total, Co.'s Rs., ... | | 32,714 1 0 |

MEMORANDUM

### DISBURSEMENTS.

| | | | | | | |
|---|---|---|---|---|---|---|
| To amount of disbursements during the year 1859, as per statement, ... ... ... | | | | 31,446 | 5 | 10 |
| ,, Balance in the Bank of Bengal on 31st December, 1859, ... ... ... ... | 1,253 | 7 | 5 | | | |
| ,, Ditto in the hands of Secretary on ditto, ... | 14 | 3 | 9 | | | |
| | | | | 1,267 | 11 | 2 |
| Total, Co.'s Rupees. | | | | 32,714 | 1 | 0 |

### RECEIPTS.

| | | | | | | |
|---|---|---|---|---|---|---|
| By amount of receipts during the year 1859, as per Statement, ... ... ... | | | | 29,725 | 3 | 10 |
| ,, Balance in the Bank of Bengal on 31st December, 1858, ... ... ... | 2,973 | 2 | 2 | | | |
| ,, Ditto in the hands of the Secretary on ditto, ... | 15 | 11 | 0 | | | |
| | | | | 2,988 | 13 | 2 |
| Total, Co.'s Rupees, | | | | 32,714 | 1 | 0 |

### LIABILITIES.

| | | | | | | |
|---|---|---|---|---|---|---|
| Amount due by the Society for American seeds of 1858-59, ... ... ... ... ... ... | 6,000 | 0 | 0 | | | |
| Ditto for Agricultural seeds of 1858-59, ... ... | 2,500 | 0 | 0 | | | |
| Ditto for English flower seeds of 1859. ... ... | 2,550 | 0 | 0 | | | |
| | | | | 11,050 | 0 | 0 |

### DEPENDENCIES.

| | | | | | | |
|---|---|---|---|---|---|---|
| Amount invested in Government Securities lodged in the Bank of Bengal, ... ... ... ... | | | | 20,333 | 5 | 4 |
| Ditto of Subscription in arrear, ... ... ... | 7,458 | 2 | 9 | | | |
| Ditto of outstandings for seeds, grafts, copies of *Journal*, &c., &c., ... ... ... | 1,200 | 0 | 0 | | | |
| | | | | 8,658 | 2 | 9 |

# LIST OF MEMBERS

OF THE

# Agricultural & Horticultural Society

OF

# INDIA.

---

*DECEMBER* 31*st*, 1859.

---

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

# OFFICE-BEARERS.

## President:

DR. THOMAS THOMSON.

## Vice-Presidents:

W. G. ROSE, ESQ.
BABOO GOBIND CHUNDER SEN.
C. A. CANTOR, ESQ.
RAJAH PERTAUP CHUNDER SING, BAHADOOR.

## Secretary and Treasurer:

A. H. BLECHYNDEN, ESQ.

## Members of Council:

BABOO SHIB CHUNDER DEB.
J. CHURCH, ESQ.
J. AGABEG, ESQ.
S. P. GRIFFITHS, ESQ.
BABOO RAMGOPAL GHOSE.
REV. JAMES LONG.
S. H. ROBINSON, ESQ.
C. B. WOOD, ESQ.
A. GROTE, ESQ.
BABOO PEARY CHAND MITTRA.
REV. T. A. C. FIRMINGER.
DR. F. J. MOUAT.

# Patron:

**THE RIGHT HONORABLE CHARLES JOHN, VISCOUNT CANNING,**

VICEROY AND GOVERNOR-GENERAL OF INDIA, ETC., ETC., ETC.

---

# List of Members.

* This Mark denotes Members who have compounded for their Annual Subscriptions.

† This Mark denotes Members who are absent from India, and therefore Non-contributors.

‡ This Mark denotes Members who, though absent, are desirous of continuing their Subscriptions

---

## HONORARY MEMBERS.

| | |
|---|---|
| The Right Honorable Sir Edward Ryan, A. M., F.A.S., London, | 1828 |
| Charles Huffnagle, Esq., M. D., | 1837 |
| Colonel John Colvin, C.B., London, | 1830 |
| J. Mackay, Esq., | |
| Don Ramon de la Sagra, Island of Cuba, | |
| Dr. Justus Liebig, Professor of Chemistry in the University of Giessen, | 1843 |
| James Hume, Esq., Magistrate, Calcutta, | 1839 |
| Lt.-Col. Francis Jenkins, Commissioner of Assam, | 1828 |
| The Right Honorable Sir Lawrence Peel, London, | 1842 |
| R. Fortune, Esq., China, | 1856 |
| Sir Arthur Buller, | 1859 |

---

## CORRESPONDING MEMBERS.

| | |
|---|---|
| D. J. Macgowan, Esq., M.D., Ningpo, | 1851 |
| Dr. J. V. Thompson, Sydney, | 1840 |
| Dr. R. Riddell, London, | 1853 |
| Mons. Natalis Rondot, Paris, | 1858 |

---

## ASSOCIATE MEMBERS.

| | |
|---|---|
| Mr. Robert Scott, Head-Gardener, H. C. Botanic Garden, Calcutta, | 1851 |
| Capt. E. P. Nisbet, London, | 1843 |

## ORDINARY MEMBERS.

| | Admitted |
|---|---|
| ABBOTT, Horace, Esq., Sampore Factory, Surdah, .. | 1858 |
| Ackland, C. J., Esq., Calcutta, .. .. .. .. | 1855 |
| Ackland,* George, Esq., Merchant, .. .. .. | 1853 |
| Aga Syud Hossein Shoostree, Merchant, Calcutta, .. | 1857 |
| Agabeg, J. Esq., Merchant, Calcutta, .. .. .. | 1854 |
| Agabeg, M. Esq., Merchant, Calcutta, .. .. .. | 1858 |
| Ahmuty, R., Esq., Supt. Govt. Estates, Mymensing, .. | 1858 |
| Ainslie, W. Esq., Civil service, Calcutta, .. .. .. | 1847 |
| Alexander,† Henry, Esq., Civil service, .. .. .. | 1846 |
| Alexander, H. A. R., Esq., Civil service, Soory, .. .. | 1855 |
| Allardice, Geo., Esq., Calcutta, .. .. .. | 1854 |
| Allan, Dr. James, Civil Surgeon, Gowhatti, .. .. | 1858 |
| Allen, J. H., Esq., Merchant, Calcutta, .. .. .. | 1850 |
| Allen, W. J., Esq., Civil service, Calcutta, .. .. | 1850 |
| Allowallea,* Rajah of Kapoorthullea, Jullunder, .. .. | 1853 |
| Anderson, P. Esq., Merchant, Calcutta, .. . .. | 1854 |
| Anderson, Major, W. W., (1st Bombay Lancers) Supdt. H. H., the Guicowar's Contingent of Horse, Rajkote, Kattywar, . .. .. .. .. .. .. | 1859 |
| Andrew, David, Esq., Indigo planter, Aurungabad, .. | 1851 |
| Angelo, Elliot, Esq., Merchant, Calcutta, .. .. .. | 1859 |
| Annesley, Capt. R. M. S., (Meywar Bheel Corps,) Karwarah, Meywar, .. .. . .. .. .. | 1858 |
| Apcar, †T. A. Esq., Merchant, .. .. .. .. | 1858 |
| Armstrong, C. M., Esq, Opium Dept., Gya, .. .. | 1858 |
| Atherton, H, Esq, Civil service, Chuprah, .. .. | 1845 |
| Aubrey, John H., Esq., Calcutta, . .. .. .. | 1856 |
| Augier, P., Esq., Calcutta Mint, .. .. .. .. | 1858 |
| Auld, S. J., Esq., Indigo planter, Bansbaria, Surdah, .. | 1846 |
| BALFOUR,† G. G., Esq., Civil service, .. .. .. | 1844 |
| Balfour, Lewis, Esq., Merchant, Calcutta, .. .. .. | 1842 |
| Barnes, C. H., Esq., Colgong, .. .. .. .. | 1858 |
| Barrow, Col. L., C. B., Commissioner of Oude, .. .. | 1859 |
| Barry, Dr. J. R., Medical Practitioner, Calcutta, . .. | 1856 |
| Barry, G. R., Esq., Serajgunge, .. .. .. .. | 1849 |
| Barry, Thomas H., Esq., Merchant, Calcutta, .. .. | 1856 |
| Battersby, Arthur, Esq., Indigo planter, Babukansi, Joynagore, . .. .. .. .. .. | 1855 |
| Baugh, Capt. F. W., (26th N. I.,) Superintendent, Keddah Establishment, Kemaon, .. .. .. .. .. | 1855 |
| Bax, J. H., Esq., Civil service, Ghazeepore, .. .. | 1855 |
| Bayley, H. V., Esq., Civil Service, Calcutta, .. .. | 1855 |
| Bayley, Stuart Colvin, Esq., Civil service, Barripore, .. | 1859 |
| Beadon, C., Esq., Civil service, Calcutta, .. .. .. | 1855 |
| Bean, Capt John, Cantonment Magistrate, Rawul Pindee, | 1859 |

*Admitted.*

Bean, ‡ J. Esq., Sub-Deputy Opium Agent, .. .. 1850
Beaufort, Francis L., Esq., Civil service, Calcutta, .. 1838
Becher, William, Esq., Gowhatti, .. .. .. .. 1855
Becher,† Col. A. M., Quarter-Master-General of the Army, .. . .. .. .. .. .. 1856
Beddy, H. W., Esq., Junr. Assist. Commissioner of Arracan, Ramree, . .. - .. .. . 1855
Begbie,† C. N. W., Esq., Merchant, .. .. .. 1854
Begg,‡ Dr. D., .. .. .. . .. . 1850
Bell, J. D., Esq., Barrister-at-law, Calcutta, .. .. 1855
Bennett, T. B., Esq., Indigo planter, Purneah, .. .. 1854
Bennett, T. H., Esq , Merchant, Calcutta, . .. .. 1857
Bentall,*† Edward, Esq., Civil Service, .. .. .. 1837
Berkeley, L., Esq., Officiating Sudder Ameen, Delhi, .. 1855
Berkeley, R , Esq., Assist.-Commissioner, Mulaon, . .. 1857
Berrill, W., Esq., Allahabad, .. .. .. .. 1857
Bindabun, Chunder Mittra, Baboo, Calcutta, .. . 1853
Bingham, R. W., Esq., Chynepore, near Sasseram, .. 1859
Birch, Major-General, R. J. H., C. B., Secretary to Government, Military Department, Calcutta, . .. . 1841
Birch, Capt. R. C., Senior Assist.-Commissioner, Chota-Nagpore, .. .. .. .. .. .. .. 1858
Birney, Lieut. J., Assist. Supdt. E. I. Jumna Canals, Saharunpore, .. . .. .. .. 1859
Bishop,* Lt. H. P., (Artillery,) Bareilly, . .. 1853
Bissumbhur Sing, Baboo, Zemindar, Soorool, .. 1857
Bivar, Capt. H. S., (18th Regiment N. I.), Principal Assistant Commissioner, Deebroghur, .. .. .. 1856
Blacker, G. M., Esq., Merchant, Calcutta, .. .. 1856
Blake, Major H W., Comg. Pegu Police Battn., Rangoon, 1858
Blanchard, Major J. H., Landour, .. .. .. 1859
Blechynden, R., Esq., Merchant, Calcutta, .. .. 1854
Blechynden, A. H., Esq , Secy. Agri-Horticultural Socy. of India, Calcutta, . .. .. .. .. . 1851
Blyth,† Philip, Esq., Merchant, .. .. .. .. 1857
Boaz,† Rev. Dr. T., .. .. .. .. .. .. 1854
Boileau, Major, G. W., Comdt. Oude Military Police, Seetapore, .. .. .. .. .. .. 1859
Bonavia, E., Esq., M. D., Assist.-Surgeon, Lucknow, .. 1859
Bourne, Walter, Esq., M. D., Calcutta, .. .. .. 1859
Bourne, Walter, Esq., Resident Engineer, E. I. Railway, Monghyr, .. .. .. .. .. .. .. .. 1855
Bowers, J. F., Esq., Indigo-planter, Purneah, .. .. 1851
Bowring,† Samuel, Esq., Civil service, .. .. .. 1843
Bracken,† William, Esq., C. S. .. .. .. . 1835
Braddon, E. N. C., Assist.-Commissioner, Sonthal Pergunnahs, Deoghur, .. .. .. .. .. 1858

Brac, T., Esq., Indigo-planter, Hatberria, Jessore, .. 1854
Brandis, Dr., D. Supt. of Forests, Rangoon, .. .. 1857
Brice, N. Esq., Dinapore, . .. .. .. .. 1859
Bridgman,‡ J. H. Esq., Indigo planter, .. .. .. 1856
Brine, Frederick, Esq., Darjeeling,.. .. .. .. 1857
Bristow, Capt. J. W., (19th N. I.), Depy.-Comr., Khangurh, Punjab, .. .. .. .. .. .. 1855
Brodhurst, M. Esq., C. S. Saharunpore, .. .. .. 1859
Brodie,*† Major T.,.. .. . .. .. .. 1836
Broncke, W. J., Esq., Indigo-planter, Dheree, .. .. 1859
Brooke, Major John C., (63rd N. I.) Commandant Meywar Bheel Corps, and Assistant Political Agent in Meywar, Neemuch, . . .. .. .. 1843
Brownlow, Lieut. H. A., (Engineers), Supt. Eastern Jumna Canals, Saharunpore, .. .. .. . . 1858
Brown, Forbes Scott, Esq., Merchant, Penang, .. .. 1840
Brown, Col. W. G., (H. M. 24th Regt.,) Ferozepore, . 1852
Brown, Capt. D., 1st Madras Fusiliers, Assist.-Commissioner, Bassein, Burmah, .. . .. . .. 1856
Brown, George, Esq., Merchant, Calcutta,.. .. .. 1856
Brown, John, Esq., Merchant, Calcutta, . .. .. 1858
Bullen, John, N. Esq., Merchant, Calcutta, .. .. 1859
Buller,*† Frederick Pole, Esq., Civil service, . .. 1837
Burbank,† Capt. Charles, Comg. H. C Steamer "Fire Queen", .. .. .. .. .. . .. 1857
Burkinyoung,† J. A., Esq., Solicitor, Supreme Court, . 1849
Burnett, Lieut.-Col. F. C, (Bengal Artillery,) Jullundur, 1839
Burton, John St. Edmund., Esq, Calcutta, .. .. 1850
Buzlall, Rhoman, Moonshee, Zemindar, Sealdah, . .. 1857

CADOGAN, T. C., Esq., Merchant, Calcutta, .. .. 1858
Cameron, J. T. D., Esq., Head-Master, La Martiniere, Cal., 1853
Campbell, W. F., Esq., Tipperah, .. . .. .. 1838
Campbell,* Archibald, Esq., M. D., Medical service, Superintendent of Darjeeling, .. .. .. .. 1838
Campbell, T. A., Esq., Gyah, .. . .. .. 1851
Campbell, Capt. A. M., (16th M. N. I.) Penang, . .. 1855
Campbell, Capt. Ivie, Enam Commr., Ellichpore, .. .. 1854
Campbell, Capt. A. H, Comg. 8th Irr: Cavalry, Seetapore, Oude, .. .. .. .. . .. 1859
Campbell,† Lieut. Henri, (63rd Regt N. I.) .. .. 1856
Campbell, George, Esq., Civil service, Lucknow, . .. 1858
Canning, The Right Hon'ble, Charles John, Viscount, .. 1856
Cantor, C. A., Esq., Merchant, Calcutta, (*Vice President*) 1851
Cantor, Dr. Theodore, Calcutta, .. .. . .. 1859
Carbery, R. J., Esq Calcutta, .. .. . .. 1853

*Admitted.*

Carew, R. R., Esq., Shajehanpore, . .. .. .. 1846
Carnegy, P., Esq., Assist.-Commissioner, Lucknow, .. 1857
Carter, J W., Esq., Merchant, .. .. .. .. 1843
Carter, T. E, Esq., Secretary, Assam Company, Calcutta, 1852
Cave, Charles, A, Esq, Indigo-planter, Konah factory, Purnea, . .. .. .. .. .. .. 1857
Cave, H, S., Esq, Indigo-planter, Purneah, .. .. 1852
Cavenagh, Lieut.-Colonel O., (32nd N. I.) Governor of the Straits Settlements, .. .. .. .. .. 1848
Champneys, Lt.-Col., E. G., (33rd N, I.) Deputy-Military-Auditor-General, Calcutta, .. .. .. .. 1848
Chapman, C. E., Esq Civil service, Lahore, .. .. 1857
Chardon, E., Esq., Indigo-planter, Goldar factory, Kishnaghur, .. .. . .. .. .. .. 1858
Cheap,† Coll. Sir John, K. C. B., .. .. .. .. 1841
Cheek, Alfred H., Esq., Civil Surgeon, Benares, .. .. 1855
Chunder Coomar Chatterjee, Baboo, Merchant, Calcutta, 1856
Chamberlain, Capt Chas., Oude Police, .. .. .. 1859
Church, James, Esq., Merchant, Calcutta, . .. .. 1850
Church,† James, Esq., Junior, Merchant, .. .. .. 1851
Clark, A. N., Esq., Calcutta, .. .. .. .. 1856
Clark, Dr Stewart, Inspector Genl. of Prisons, N. W. P., . 1855
Clarke, H. R., Esq., Civil service, Bareilly, .. .. 1856
Clarke,† John, Esq., .. . . .. .. 1855
Clarke, G. R., Esq, Indigo-planter, Roodeipoor *viâ* Bongong, .. .. .. .. . .. 1855
Clarke, Longueville, Esq., F. R. S., Barrister, Supreme Court, Calcutta, . .. .. .. .. .. 1839
Cleghorn, Dr. H., Conservator of Forests, Madras, .. 1858
Clemen, Edward, Esq., Tobacco planter, Sandoway, .. 1855
Clerk, Dr. D. G., Dentist, Calcutta, .. .. .. 1856
Clerk, Lieut. Malcolm G., (D. P. W.) Lucknow, .. 1858
Cockburn, G. F., Esq., Civil service, Cuttack, .. .. 1856
Cockburn, Wm., Esq., Raneegunge, .. .. .. 1846
Collins, Dr. J. C, Civil Surgeon, Darjeeling, .. .. 1856
Collis, S. E., Esq., Solicitor, Calcutta, .. .. .. 1859
Colvile,*† Sir J. W., .. .. .. .. .. 1849
Congreve, Lieut-Col. G., C. B., H. M. 29th Regt. .. Quarter-Master-General Queen's Troops, Simlah, .. 1848
Connew, C., Esq., Calcutta, .. .. .. .. 1858
Cooke, H. W., Esq, Sub-Depy. Opium Agent, Bhaugulpore, .. .. .. .. .. .. 1857
Cooke, C. N., Esq., Depy-Secretary, Bank of Bengal, .. 1859
Cope, Henry, Esq., Merchant, Umritsur, . .. .. 1847
Cosserat, P., Esq., Ghazeepore, .. .. .. .. 1857
Cosserat, Lewis, Esq., Indigo-planter, Lall Seraiah, Chumparun, . .. .. .. .. .. 1859

*Admitted.*

Cossinauth Chowdry, Baboo, Cossipore, .. .. .. 1849
Court,† M. H., Esq., Civil service, .. .. .. 1852
Cowell, James, Esq., Merchant, Calcutta, . .. .. 1838
Cowie,* Henry, Esq., Merchant, Calcutta, .. .. 1837
Cox,† Major-General H. C. M., 58th Regt. N. I... .. 1838
Cox,† J. H. W., Esq. Indigo-planter, .. .. .. 1845
Craster,† E. C., Esq., Civil service, .. .. .. 1858
Craster, Lieut. G. A., Engineers, Darjeeling, .. .. 1855
Crawford, J. A , Esq., Civil Service, Calcutta, .. .. 1857
Creswell, C. E., Esq , Merchant, Calcutta, .. .. 1855
Crommellin, Lieut -Col., J. A., Darjeeling, .. .. 1857
Crooke, Henry, Esq , Merchant, Calcutta, .. .. 1858
Crump, R. W., Esq., Monjoul Factory, Monghyr, .. 1859
Cumming, William, Esq., Indigo planter, Malda, .. 1851
Cunliffe,† R. E Esq., Civil service, .. .. .. 1851
Cunliffe, David, Esq., Civil service, Rajshahye, .. .. 1853
Currie, Charles, Esq., Civil service, Bolundshuhur, .. 1855

Dalrymple,† James, Esq., Indigo-planter, .. .. 1846
Dalton, Capt. E. T., Commissioner of Chota Nagpore, .. 1848
Dampier, H. L , Esq., Civil Service, Tirhoot, .. .. 1857
Dampier, William, Esq., Civil service, Calcutta,.. .. 1844
Daunt, W., Esq., Indigo-planter, Peepra, Champarun, .. 1857
Davies, Capt. T., Commt. Police Battn., Booldanah, .. 1855
Davies, J. S., Esq., District Supdt. of Roads, Bograh, .. 1859
Davis, Capt. J. S., Senior Assist.-Commissioner, Chota Nagpore, .. .. .. .. .. .. .. 1857
Davis, H. M., Esq., Civil Surgeon, Noacolly, .. .. 1856
D'Cruz, A., Esq., Junior, Secretariat, Govt. of India, .. 1852
Dearman,† George, Esq., Merchant, .. .. .. 1845
Decruz, E., Esq., Financial Department, Calcutta, .. 1857
Degumber Mitter, Baboo, Merchant, Calcutta, . .. 1858
DeMornay, H., Esq., Assam Company, Calcutta,.. .. 1843
DePenning, George, Esq., Calcutta, .. .. .. 1856
DeSaran, Eugene Dubois, Esq., Cootooreah factory, Kishnaghur, .. .. .. .. .. .. 1858
Deverell, H., Esq., Indigo-planter, Ackergunge factory, Berhampore, .. .. .. .. .. .. 1854
Dicey,† Capt. Wm., .. .. .. .. .. .. 1858
Dick,† R. K., Esq., Civil service, .. .. .. .. 1846
Dickens, Capt. C. H., Artillery, Calcutta,.. .. .. 1856
Dickey, Col. E. J., Supt. of Studs, Meerut, .. .. 1851
Dickson, T., Esq., Rampore Beauleah, .. .. .. 1859
Dirom,† William Maxwell, Esq., Civil service, .. .. 1837
Dorin,† Joseph Alexander, Esq., .. .. .. .. 1837
Douglas, Francis, Esq., M. D., Civil Surgeon, Lucknow, .. .. .. .. .. .. .. 1859

| | |
|---|---|
| | *Admitted.* |
| Douglas,† Stewart, Esq., Merchant, .. .. .. | 1851 |
| Doveton, H., Esq., Deputy-Magistrate, Buheera, Tirhoot, | 1855 |
| Dow, E A., Esq., Solicitor, Supreme Court, Calcutta, .. | 1858 |
| Doyne, Richard, Esq., Barrister-at-law, Calcutta,.. .. | 1855 |
| Drabble,† R. R., Esq., Merchant, .. .. .. .. | 1850 |
| Drummond,† The Hon'ble R., Civil service, .. .. | 1852 |
| Dwarkanath Mullick, Calcutta, .. .. .. .. | 1859 |
| Duff,‡ Wm., Esq.. Indigo-planter, .. .. .. .. | 1847 |
| Dumergue, J S., Esq., Civil service, Allyghur, .. .. | 1847 |
| Duncan, R. Esq., Howrah, .. .. .. .. | 1859 |
| Dunford, Hamilton E. A., Esq., Bengal Yeomanry Cavalry, Hoshingabad. .. .. .. .. .. .. | 1856 |
| Durand, P., Esq Indigo-planter. Jessore,.. .. .. | 1852 |
| Durrschmidt, Chas , Esq , Merchant, Calcutta, .. .. | 1847 |
| | |
| EAMES, R. Esq , Merchant, Calcutta, .. .. | 1855 |
| Earle, Dr F. J., Civil Surgeon, Purneah, .. .. | 1859 |
| Eddis, W. U., Esq., Hizlabut Factory, Pubna. .. .. | 1858 |
| Edgeworth,† Michael Pakenham, Esq., Civil service, .. | 1836 |
| Egerton., James, Esq., Cajah factory, Purneah, .. .. | 1856 |
| Elias,* Owen John, Esq., Merchant, Calcutta, .. .. | 1837 |
| Eliot, Capt. John, Artillery, Barrackpore, .. .. | 1839 |
| Elliot, J. B., Esq., Civil service, Patna, .. .. .. | 1851 |
| Elliot, J. Scott, Esq., Merchant, Calcutta, . . .. | 1851 |
| Elliott,† W. Henry, Esq., .. .. .. .. .. | 1839 |
| Erskine, H. C., Esq., Indigo-planter, Elambazar, Paneeghur, .. .. .. .. .. .. | 1855 |
| Eshanchunder Bose, Baboo, Merchant, Calcutta,.. .. | 1848 |
| Evans, George E., Esq., Curator, Geological Museum, Calcutta, .. .. .. .. .. .. | 1859 |
| Ewing,† William, Esq., Merchant, .. .. .. | 1851 |
| Eyre, Col. Vincent, C. B., Bengal Artillery, Ishapore, .. | 1859 |
| | |
| FADDY, Major S. B., 36th N. I., Nynee Tal, .. .. | 1851 |
| Fagan, G. S., Esq., Barrister, Supreme Court, Calcutta,.. | 1855 |
| Fagan, Capt W. F., Commt. 7th Police Bn. Dacca, .. | 1859 |
| Falcon, A. B., Esq., Civil service, Noacolly, .. .. | 1858 |
| Falconer,† Dr. D. McL., .. .. .. .. .. | 1857 |
| Falconer,† H., Esq., M. D., .. .. .. .. | 1859 |
| Farquharson, R. N., Esq., Civil Service, Patna, .. .. | 1857 |
| Fell, H H., Esq., Zemaneah Factory. Ghazeepore, .. | 1850 |
| Fergusson, William Fairlie, Esq., Merchant, Calcutta, .. | 1837 |
| Field, George, Esq., Sub-Deputy Opium Agent, Arrah, .. | 1857 |
| Finch, Justin, Esq., Indigo planter, Shahpore, Oondee, Tirhoot, .. .. .. .. .. .. .. | 1852 |
| Findley, J., Esq., Merchant, Moulmein, .. .. .. | 1854 |
| Firminger, Rev. T. A. C., Chinsurah, .. .. .. | 1851 |

| | Admitted. |
|---|---|
| Fitzwilliam, Wm. Shelford, Esq., Agent Commercial of India, Calcutta, .. .. .. .. .. .. | 1856 |
| Foord,† E. B., Esq., Madras Civil service, .. .. | 1853 |
| Forster, Capt. F. B., 5th Fusiliers, Allahabad, .. .. | 1859 |
| Forbes,† Alexander, Esq., .. .. .. .. . | 1855 |
| Forbes, Lieut. H. T., Supt. Nuddea Rivers, Berhampore, | 1856 |
| Forlong, James, Esq., Indigo planter, Neechindepore, Kishnaghur, . .. .. .. .. .. | 1850 |
| Fraser,† Thomas, Esq , Indigo planter, .. .. .. | 1856 |
| French, Gilson R , Esq., Indigo planter, .. .. .. | 1841 |
| French, Henry G., Esq., Indigo-planter, Jessore .. .. | 1839 |
| Fytche, Major A., (70th Regiment N. I ,) Deputy Comr. Bassein, .. .. .. .. .. .. .. | 1849 |
| | |
| Gale, C. W., Esq., Doora factory, Tirhoot, .. .. | 1856 |
| Gale, John, Esq., Pundul factory, Tirhoot, .. .. | 1859 |
| Galiffe, J. F., Esq., Collector of Canal Tolls, Calcutta .. | 1856 |
| Garnault, Lt. H. W , Executive Engineer, Midnapore, .. | 1859 |
| Garstin, Major H. M., (36th Regt. N. I.) Comdt. Arracan Battalion, Akyab, . .. .. .. .. .. | 1855 |
| Garstin, Genl. Edward, (Engineers,) Darjeeling, . .. | 1834 |
| Gasper, G M., Esq , Merchant, Calcutta, .. .. | 1846 |
| Gennoe, T A. M., Esq , Supt. Benares Opium factory, Ghazeepore, .. .. .. .. .. .. | 1859 |
| George, Adam, Esq., Calcutta, .. .. .. .. | 1853 |
| Gilmore, W. F., Esq., Merchant, Calcutta, .. .. | 1850 |
| Glinn, G. J. H , Esq., Engineer, E. I. Railway, Colgong, | 1858 |
| Glover, F. A., Esq., Civil service, Mymensing, .. .. | 1859 |
| Gobindchunder Dutt, Baboo, Merchant, Calcutta, .. | 1857 |
| Gobind Chunder Sen, Baboo, Merchant, Calcutta, (*Vice-President,)* .. .. .. .. .. .. | 1850 |
| Gopaul Laul Tagore, Baboo, Merchant, Calcutta, .. | 1850 |
| Gordon, D. T., Esq., Manager Silk Filatures, Surdah, .. | 1859 |
| Gordon, Thomas, Esq , Merchant, Mirzapore, .. .. | 1846 |
| Gouldhawke, J., Esq , Indigo-planter, Jessore, .. .. | 1851 |
| Graham, H., Esq , Superintending-Surgeon, Pegu, .. | 1855 |
| Graham, Joseph, Esq , Barrister-at-law, Calcutta .. | 1858 |
| Grant, Hon'ble John Peter, Civil service, Calcutta, .. | 1836 |
| Grant, James, Esq., Civil service, Dinagepore, .. .. | 1837 |
| Grant, Thomas, Esq., Indigo-planter, Bhaugulpore, .. | 1848 |
| Grant, G. H., Esq., Indigo-planter, Bhaugulpore, .. | 1859 |
| Gray, J. J., Esq , Indigo-planter, Malda, .. .. | 1846 |
| Grey, Edward, Esq., Civil service, Gyah, .. .. .. | 1859 |
| Griffiths, S. P., Esq., Merchant, Calcutta, .. .. | 1844 |
| Grote,* Arthur, Esq., Civil service, Calcutta, .. .. | 1837 |
| Gubbins, M. R., Esq., Civil service, Agra, .. .. | 1842 |
| Guise, J. A., Esq., Secy., Public Garden, Banda, .. | 1855 |

*Admitted.*

Guise, Dr. J. A., Civil Surgeon, Moorshedabad, . .. 1859
Guise, Lieut.-Col. John C. 90th Lt. Infy. Seetapore, Oude, . .. .. .. .. .. .. 1859

HADDOW, The Rev. C. E., B A., Nynee Tal, .. .. 1857
Hale† Lieut. G H., (Adjt. 2nd Regiment Inf. Oude Irregular Force,) .. .. . .. .. 1857
Hall, Major G. M., (Commd. 4th Regt. Irr. Cavalry,) Nowgong, .. .. .. .. . . .. 1854
Hall, James M, Esq., Merchant, Calcutta, .. .. 1851
Halliday, F. M., Esq, C S. Jessore, .. . .. 1859
Hamilton, H. C. Esq., Civil service, Benares, .. .. 1851
Hamilton, Rowland, Esq., Merchant, Calcutta, .. .. 1855
Hampton, J. P., Esq., Indigo-planter, .. .. .. 1856
Hampton, R., Esq, Civil service, Tumlook, . .. 1854
Hannyngton, Lt-Col. John C, Deputy Military Aud. General, Calcutta, . .. .. . .. .. 1837
Hannay, Lt.-Col. Simon Fraser, (43rd Regiment N. I,) Commanding Assam Light Infantry, Debrooghur, .. 1837
Harvey, William, Esq. Civil Engineer, Indore, .. .. 1859
Harvey, C. F., Esq Bengal Civil Service, Serajgunge, .. 1859
Haughton, Capt. J. C., Supt, Port Blair, Andamans, .. 1859
Hawkins,*† John Abraham Francis, Esq, .. .. 1837
Haworth, William, Esq, Merchant, Calcutta, .. . 1851
Hay,‡ John Ogilvie, Esq., Merchant, . .. .. 1858
Haywood, Joseph, Esq., Civil Engineer, E. I. Railway, River Soane, Dinapore, .. .. .. .. 1856
Healy, B. Esq., Merchant, Bimlipatum, .. .. .. 1859
Hearsey, Major-General Sir J. B. K. C. B., Comg. Presy. Divn. Barrackpore, . .. . . 1856
Hedger, J. F., Esq., Radakissenpore, *viâ* Kamra, .. 1853
Helbert, Lt. F. J. H, (5th Madras Cavary,) Indore, .. 1855
Heralall Seal,* Baboo, Calcutta, .. .. .. . 1858
Herriot,† John, Esq., Merchant, . .. . .. 1852
Hickey, W. R Gillbert, Esq, Civil Engineer, Colgong, . 1856
Higgs, Rev E., Debrooghur, Upper Assam, . .. 1853
Hill, James, Esq., Allahabad, .. .. .. .. 1858
Hills,*† James, Esq, Senior, Indigo-planter, .. . 1837
Hitchens, Lt. C. J., (late 5th N. I.) Ex.-Officer, Dacca, . 1857
Hollingberry, R. H., Esq, Calcutta, .. .. .. 1856
Hollings, Charles, Esq., Gyah, .. . . .. 1841
Holroyd, Capt. Chas., Assist.-Commr. Sibsagur, Assam. .. 1849
Hope, Alexander, Esq, Civil Service, Beerbhoom, .. 1859
Hopkinson, Capt. H., Commissioner, Tenasserim Provinces, 1856
Horee Mohun Sen, Baboo, Calcutta, .. .. .. 1837
Horne,† C, Esq, Civil service, .. .. .. .. 1854
Houghton, Lt.-Col. R. (16th Regt. N. I.,) Mussooree .. 1847

*Admitted.*

Hudson, C. K., Esq., Offg.-Political Assist. to Commr. Assam, Cherra, .. .. .. .. .. .. 1855
Hudson,† W. S., Esq , Jun.-Assist. to Commissioner of Assam, .. .. .. .. .. .. .. 1854
Hudson, E., Esq. E. I. Railway Calcutta, . .. .. 1859
Hume, A. O., Esq , Civil-service, Secy. Horticultural Garden, Etawah, . .. .. .. .. . 1856
Huthwaite, Col. Edward, C. B., (Horse Arty.,) Nainee Tal, 1841
Hutton, Capt. Thos., Mussooree, .. .. .. .. 1855

Impey, Capt. Archibald, Bengal Engineers, Calcutta, .. 1856
Ilbery,† J. W. H., Esq , Merchant, .. .. .. 1858
Inglis, Henry, Esq., Cherra Poonjee, .. .. .. 1835
Inglis,† J., Esq., Civil service, .. .. . .. 1851
Ingram, Lieut J. S., (1st European Bengal Fusiliers,) Assist.-Supt. Pegu and Arracan Mountain Road, .. 1855
Irby, Capt. L H., H M. 90th Regt. Seetapore, Oude, .. 1859
Ishore Persaud Narain Sing Bahadoor, Rajah of Benares, .. 1854
Issur, Chunder Sing Rajah, Zemindar, Calcutta, .. .. 1857

Jackson, A. J , Esq , Civil service, Hoogly, . .. 1853
Jackson, L S., Esq , Civil service, Bauleah, .. .. 1852
Jackson, Dr. Neville, Civil Medcal Officer, and Sub-Assist. Commissioner, Sumbulpore, .. .. .. .. 1859
James,† Capt H. C , (32nd Regt. N I ) .. .. .. 1842
Jameson, W., Esq , M. D , Supt. H. C. Bot. Garden, Saharunpore, .. . .. .. .. .. 1852
Jenkins,† Lieut. H. G., (10th Light Cavalry,) .. .. 1852
Jenkinson, Joshua, Esq., Calcutta, .. .. .. .. 1855
Jennings, C. R., Esq., Silk Manufacturer, Rampore Bauleah, 1848
Jennings,† Frederick, Esq , . .. .. .. .. 1856
Johnson, John, Esq., Merchant, Calcutta, . .. . 1856
Johnson, P , Esq., Merchant, Calcutta, .. .. .. 1846
Johnstone, Capt. H. C., Revenue Survey, Punjab, .. 1852
Johnston, W. Esq., Civil Service, Allahabad, .. .. 1857
Jotendromohun Tagore, Baboo, Calcutta, .. .. .. 1858
Joygopal Bysack, Baboo, Calcutta, . .. .. 1858
Joykissen Mookerjee, Baboo, Zemindar, Ooterparah, .. 1852
Judge, W. J. Esq , Solicitor, Calcutta, .. .. .. 1858
Judge,† Spencer, Esq , Solicitor, Supreme Court. .. 1843
Judge, Lt. C. N., Bengal Engineers, Dehree Ghat, on the Soane, Grand Trunk Road, .. .. .. .. 1859

Kaleekissen Mittra, Baboo, Zemindar, Baraset, .. 1859
Kalee Prosono Sing, Baboo, Calcutta, .. .. .. 1857
Kalee Coomar Dey, Baboo, Merchant, Calcutta, .. .. 1858
Kelner, G. F, Esq , Burdwan, .. .. .. .. 1858

*Admitted.*

Kemp, F. B., Esq , Civil service, Backergunge, .. .. 1856
Kemp, G. T. B. Esq. Deputy-Magistrate, Chittagong, .. 1859
Kendal, B. Esq., Civil Surgeon, Balasore, .. .. .. 1858
Kenny, T., Esq., Indigo-planter, Salgamudea, Commercolly, 1852
Ketromohun Chatterjee, Baboo, Asst -Civil-Auditor, Calcutta, 1858
Khaluch Chunder Ghose, Baboo, Calcutta, .. . 1857
Kilby, Thos. F., Esq , Merchant, Calcutta, .. .. 1859
King, Arthur Kaye, Esq., Merchant, Calcutta, .. 1858
King, Robert, Esq , Sub-Deputy Opium Agent, Patna, .. 1850
Kinleside,† Lt -Col R. R., (Artillery.) .. .. 1847
Kissenkishore Ghose, Baboo, Pleader, Sudder Court, Calcutta, 1853
Kistogopal Ghose, Zemindar, Calcutta, .. . .. 1853
Knowles H., Esq., Merchant, Calcutta, .. .. 1852
Knox, T. J , Esq , Madras Civil service, Vizagapatam, .. 1858
Knyvett, Lt-Col. W. J. B. (38th Lt. Infy.,) Mussooree, . 1851

LAMB, Major Wm , (51st Regt N I ,) Assist -Adjt -Genl , Lahore Division, .. .. .. .. .. .. 1847
Landale, R. B.. Esq. Indigo-planter, Dheeree *viâ* Shergotty, .. . . .. .. .. .. 1853
Landale, Walter, Esq., Indigo-planter, Lutteepore factory, Bhaugulbore, .. .. .. .. .. .. 1851
Lance, C. E. Esq , Civil service, Dacca, .. .. .. 1858
Lane, Major-Genl J. T , C. B., Calcutta, .. .. . 1851
Lane, T. B., Esq , Civil service, Howrah, .. .. . 1855
Larkins, T. P., Esq , Civil service, Chittagong, .. .. 1853
Larmour, R. T., Esq , Indigo-planter, Mulnauth, *viâ* Bongong, .. .. .. . .. .. .. 1848
Lauder, Richard, Esq , Merchant, Calcutta, .. .. 1856
Lautour, E F., Esq.,Civil service, Patna, . .. .. 1847
Lautour, Edward, Esq., Civil service, Calcutta, .. .. 1851
Lee,† H. J , Esq , Depy.-Secy., Bank of Bengal, .. 1851
Lemarchand, John, Esq., Barh *viâ* Patna, .. .. 1859
Leonard, H.. Esq., Supt. of the Mutlah, .. .. .. 1858
Levinge, H. C., Esq , E. I., Railway Dept., Colgong, .. 1855
Lewis, W. T., Honble, Resident Councillor, Penang, .. 1840
Limond, R. S., Esq , Indigo-planter, Toolseah Factory, Bhaugulpore, .. .. .. .. .. .. 1859
Lind,† F. M., Esq., Civil service, .. .. .. 1851
Lindsay, D. B., Esq., Merchant, Calcutta,.. .. .. 1855
Little,† Lt.-Col. Archibald (H. M. 9th Lancers,) .. .. 1853
Lloyd, Major-Genl. G. W. A., C. B. Darjeeling,.. .. 1838
Loch, George, Esq , Civil service, Calcutta, . . .. 1852
Loch, J. A., Esq , M. D. Civil Surgeon, Mirzapore, .. 1859
Login,*† Sir J. S., Medical service, .. .. .. 1843
Lomer,† Major W. H., .. .. .. .. .. 1854
Long, The Rev. James, Church Missionary Society, Calcutta, 1855

| | Admitted. |
|---|---|
| Lord, G. T., Esq., Manager Bengal Coal Company, .. | 1858 |
| Low,† The Hon'ble Major-General, J., C. B., .. | 1854 |
| Lowther, Capt W. H, (1st Assam, Lt. Infy.,) Debrooghur, | 1856 |
| Lowther,*† Robert, Esq., Civil service, .. .. | 1836 |
| Lumsden,† Capt. P. S., Dy. Asst. Qr. Mr. Genl. .. | 1851 |
| Lushington, Edward, Esq., Civil service, Calcutta, .. | 1848 |
| Lyall,† John, Esq., Merchant, .. .. .. .. | 1849 |
| | |
| MACCREA, R., Esq., Commissariat Dept., Thyet-Mew, . | 1856 |
| Macdonald, A. G., Esq., Civil service, Rungpore, .. | 1852 |
| Macdonell, Capt. A. A., (40th N. I.,) Poosa, Tirhoot, .. | 1855 |
| Mackay, R. B., Esq. Merchant, Calcutta, .. .. | 1858 |
| Mackenzie, H. Esq., Indigo-planter, Jingergatchie, Jessore, | 1850 |
| Mackenzie, W. L., Esq., Deputy-Magistrate, Serajgunge, | 1858 |
| Mackey, D. C., Esq., Merchant, Calcutta, . . .. | 1854 |
| Mackinnon, Lieut. W. C., H. M. 87th Fusiliers, Gya, .. | 1858 |
| Mackintosh,† George, G, F C.vil service, . .. | 18 |
| Mackintosh,† A eas, Esq. go-planter, .. .. | 1849 |
| Maclean, A. Esq., Civil service, Kishnaghur, .. . | 1858 |
| Macleod, George, Esq., Rajapore Factory, Rajsharye, .. | 1858 |
| Macnair, George, Esq., Indigo-planter, Jessore, .. .. | 1851 |
| Macnamara, N. C, Esq, Civil Surgeon T hoot, .. | 1859 |
| Macpherson,*† George G., Esq, .. .. .. | 1836 |
| Mactier, T. B., Esq, Civil service, Cuttack, . .. | 1846 |
| Maharaj* Dheraj Matabchnnder Bahadoor, Rajah of Burdwan, .. .. .. .. .. .. | 1836 |
| Maharajah of Cooch Behar, .. .. .. .. | 1856 |
| Malchus, G., Esq., Merchant, Calcutta, .. .. | 1852 |
| Malet, O. W, Civil service, Beerbhoom, .. .. | 1857 |
| Main, Richard, Esq., Merchant, Calcutta, .. .. | 1858 |
| Manderson,† Robert, Esq., Civil service, .. .. | 1855 |
| Mangles,† J. H., Esq., Civil Service, .. .. .. | 1053 |
| Manickjee,* Rustomjee, Esq., Merchant, Calcutta, .. | 1837 |
| Mansell,† Charles Grenville, Esq., Civil service, .. .. | 1837 |
| Mantell, Dr. A. A., Civil Surgeon, Balasore, . .. | 1859 |
| Menzies, T., Esq, Merchant, Mirzapore, .. .. .. | 1858 |
| Marriott,† Major E., (57th N. I.,) .. .. .. | 1852 |
| Marriott, Hunt, Esq., Emigration Agent, Calcutta, .. | 1859 |
| Martin, Major T., Offg. Presy. Pay Master, Calcutta, .. | 1852 |
| Martin,† Simon N., Esq., Civil service, .. .. .. | 1855 |
| Maseyk, Henry, Esq Neemtolla, Moorshedabad, .. | 1858 |
| Maseyk, J. W., Esq., Indigo-planter, Jungypore, .. | 1858 |
| Mason,† Lt C., Crauford, (48th M. N. I. .. .. | 1853 |
| Mason, Capt. James, Darjeeling, .. .. .. .. | 1858 |
| Masters,* J. W., Esq, Assist.-Commissioner of Assam, Golah Ghat., .. .. .. .. .. .. | 1835 |
| Mathie,* Lt.-Col. James, (21st N. I.,) Darjeeling, .. | 1836 |

*Admitted.*

Maunsell, Lt. F. R., Engineers, Rookee, .. .. .. 1855
Maxwell, David, Esq., Indigo-planter, Futteyghur, .. 1852
May,† George, Esq , Merchant, .. .. .. .. 1857
McCallum,† D., Esq , Merchant, .. . .. .. 1836
McDonell,† E., Esq , Sub-Deputy Opium Agent, .. 1842
McLeod,† Donald Friend, Esq , Civil service, .. .. 1836
Meares, Geo. Esq Indigo-planter, Sindooree, Jessore, .. 1855
Mercer,* G. G., Esq , Indigo-planter, Futtyghur, .. .. 1846
Miles, Capt. C W. (Com. 3rd Regt. Oude Irregular Infy.,) Azimghur, .. .. . .. .. .. 1857
Miller, Edward, Esq. Merchant, Calcutta, .. .. 1856
Mills,*† Andrew John Moffat, Esq,, Civil srevice, .. 1836
Mills, R. Esq., E. I. Railway, Howrah, .. .. .. 1858
Mohr, Edward, Esq., Merchant, Arracan, .. .. .. 1857
Monckton,† H., Esq., Civil service, .. .. .. 1847
Moncrieff, R S., Esq , Bank of Bengal, Calcutta, .. .. 1858
Money,*† William James Henry, Esq., Civil service, .. 1836
Montgomery, The Hon ble Sir R., C. S , Lahore, .. 1848
Morgan, R. B., Esq., Civil service, Agra, . . .. .. 1852
Morrell, R., Esq Zemindar, Backergunge, .. .. 1853
Morrieson, Major R., Political Agent, Bhurtpore, . .. 1853
Morris, Dr Thomas John, Akyab, . .. .. 1859
Morris, Frederick W Esq., Madras Civil service, Chitterpore, Gangam, .. . .. .. .. 1859
Morris,† James, Esq., Merchant, .. .. .. .. 1855
Morton, Capt. William Elliot, (Bengal Engineers,) Roorkee, .. .. .. .. .. .. .. 1851
Mountjoy, Dr. W. J., Civil Surgeon, Akyab, .. .. 1859
Mouat, Dr. F. J , Inspector of Jails, L. P., .. . 1856
Murdoch, H. H., Esq , Merchant, Calcutta, .. .. 1858
Murray, Capt. James, Mussooree, .. .. .. .. 1855
Murray, J. C., Esq , Calcutta, .. .. .. .. 1856
Murrray, Lt. C., Commg. Sebundy Sappers, Darjeeling,.. 1855
Muspratt, J. R., Esq., Civil service, Bhaugulpore, .. .. 1847

Naesmyth, J., Esq , Civil service, Goordaspore, Punjab,.. 1852
Newcomen, Robert, Esq., Indigo-planter, Connanuggur Facty., Kishnaghur, .. .. .. .. .. 1859
Nicol,† F. A M., Esq., .. .. . .. .. 1851
Nilmoney Muttyloll, Baboo, Calcutta, .. .. .. 1858
Nuthall, R. D , Esq., Assist Supt. Kheddahs, Deebroghur, 1858

Oakes, Capt. W. H., Deputy-Commissioner, Chota Nagpore, .. .. .. .. .. .. .. 1857
O'Brien,, E. H., Esq., Calcutta, .. .. .. .. 1858
Oboychurn Goho, Baboo, Merchant, Calcutta, .. .. 1856
Ockelton, T. P., Esq., Calcutta, .. .. .. .. 1856

| | Admitted. |
|---|---|
| Oliva, L. B., Esq., Merchant, Calcutta, .. .. .. | 1857 |
| Omachurn Mittra, Baboo, Merchant, Calcutta, .. .. | 1857 |
| Oman, C P. A., Esq., Indigo-planter, Hatowree Factory, Tirhoot, .. . .. .. • .. .. .. | 1859 |
| Onraet, P. T., Esq., Bhaugulpore, .. .. .. .. | 1857 |
| Onslow, H. P., Esq., Collector of Bassein, . .. | 1859 |
| Orr, Capt. A. P., Deputy-Commissioner, Salone, Oude, . | 1859 |
| Outram, the Hon'ble. Lieut.-General Sir James, Bart., G. C. B., Member of the Supreme Council, Calcutta, . | 1855 |
| Owen, Capt W G., (11th Madras N. I.,) Nursapatam, near Payakcrowpett, .. .. .. .. .. | 1846 |
| | |
| PALMER, R. S , Esq , Merchant, Calcutta, .. .. | 1844 |
| Palmer, Charles, Esq., Medical service, Howrah, . .. | 1848 |
| Palmer, Dr. W. J., Civil Surgeon, Ghazeepore, .. .. | 1856 |
| Palmer, A V., Esq., Civil service, Patna, . .. .. | 1858 |
| Palmer, Geoge, Esq , Civil service, Bijnour, . . | 1859 |
| Pambertom, Lieut R. Boileau, (Bengal Engineers) Seetapore. | 1859 |
| Parish, Revd. Charles, Chaplainof Moulmein, .. .. | 1856 |
| Parry, John, Esq , Merchant, Calcutta, . . .. | 1856 |
| Parsons, Major-Genl James, C. B., (50th Regiment N. I.) Commanding Rohilkund District, Bareilly, .. .. | 1838 |
| Paterson, C. Esq., Indigo-planter, Colgong, .. .. | 1858 |
| Paul, G. C., Esq., Barrister-at-law, Calcutta, .. .. | 1856 |
| Peacock, the Honorable Barnes, Chief Justice, Supreme Court, Calcutta, .. . .. .. .. | 1852 |
| Peary Chand Mittra, Baboo, Secretary Public Library, Calcutta, .. .. .. .. .. .. .. | 1847 |
| Peary Mohun Chowdry, Baboo, Zemindar, Calcutta, .. | 1858 |
| Pereira,† Francisco, Esq , Merchant, . .. .. | 1850 |
| Pereira, L. S. B , Esq., Asst-Engineer, Sonthal Pergunnahs-Pukour, via Jungepore, .. .. .. . .. | 1859 |
| Perkins, Dr. R. H., Civil Surgeon and Asst. Salt Agent, Hidgelee, .. .. .. .. .. .. .. | 1859 |
| Perrin, Monsieur, J. Silk Filature, Berhampore, .. .. | 1859 |
| Pertap Chunder Sing,* Bahadoor, Rajah, Zemindar, Pakpara, (*Vice-President*) .. .. .. .. .. | 1847 |
| Peskett, William, Esq., M. D., Civil Surgeon, Simlah, .. | 1856 |
| Peterson, A T. T., Esq , Barrister, Supreme Court, Calcutta, .. . .. . .. .. | 1849 |
| Phayre, Col. A. P., Commissioner of Pegu, .. .. | 1841 |
| Phillippe, Clement, Esq., Indigo-planter, Balacole, Pubna, | 1851 |
| Phillips, James, Esq., Indigo-planter, Dhoolorry Factory, Pubna, .. .. .. .. .. .. .. | 1858 |
| Pinheiro, J. A., Esq , Thaneysur, .. .. . .. | 1856 |
| Pittar, C. J., Esq., Calcutta, .. .. .. .. | 1857 |

| | Admitted. |
|---|---|
| Poe,† H. H., Esq., Solicitor, | 1854 |
| Pogose,† J. G. N., Esq., Zemindar, | 1856 |
| Porteous, H. A., Esq., Akyab, | 1859 |
| Pottit, Pabun Sen, Baboo, Merchant, Calcutta, | 1847 |
| Power, Capt. E. H., Dy-Judge-Advocate-Genl., Rangoon, | 1856 |
| Prankissen Mookerjee, Baboo, Merchant, Calcutta, | 1858 |
| Preonauth Sett, Baboo, Calcutta, | 1852 |
| Prestwich, E., Esq., Merchant, Calcutta, | 1858 |
| Pringle, Dr. R. Civil surgeon, Cuttack, | 1859 |
| Prinsep, H. T., Esq., Civil service, Midnapore, | 1858 |
| Prinsep,† Charles Robert, Esq., L. L. D., | 1831 |
| Prinsep, J. H., Esq., Civil service, Sealkote, | 1851 |
| Prosonnonarain Deb, Bahadoor Roy, Dewan of His Highness the Nawab of Moorshedabad, | 1859 |
| Prosononath Roy, Rajah, Zemindar, Digaputi, Nattore, | 1851 |
| Prosono Coomar Tagore, Baboo, Calcutta, | 1833 |
| Puddumlochun Mundul, Baboo, Balasore, | 1857 |
| Pugh, Capt. J., R. (47th N. I.) Commt. Police Corps, Sooree, | 1859 |
| Punchannun Mookerjee, Baboo, Calcutta, | 1858 |
| | |
| Raban, Capt. H. (36th N. I.) Calcutta, | 1858 |
| Raikes, Charles, Esq., Civil service, Secy. Local Committee, Mynpooree, | 1850 |
| Raikes, H. T., Esq., Civil service, Calcutta, | 1857 |
| Rajendralal Mittra, Baboo, Calcutta, | 1851 |
| Rajendur Dutt, Baboo, Merchant, Calcutta, | 1848 |
| Rajkissen Mookerjea,* Baboo, Landholder, Ooterparah, | 1836 |
| Ramanauth Tagore, Baboo, Calcutta, | 1842 |
| Ramapersaud Roy, Baboo, Calcutta, | 1848 |
| Ramchund Sing, Rajah, Calcutta, | 1843 |
| Ramgopal Ghose, Baboo, Calcutta. | 1840 |
| Ramkissen Doss, Baboo, Calcutta, | 1858 |
| Ramnarain Mookerjee, Baboo, Zemindar, Jonaye, | 1858 |
| Ram Rutton Roy, Baboo, Zemindar, Burranagore, | 1858 |
| Ramsay, Major George, Resident at Nepal, | 1855 |
| Rao of Bedla, | 1859 |
| Ravenshaw, T. E., Esq., C. S., Secy Public Garden, Monghyr, | 1853 |
| Reade, C. W., Esq., Madras Civil service, Vizagapatam, | 1859 |
| Reddie,† R. M., Esq., Merchant, Calcutta, | 1846 |
| Reid, H. M., Esq., Civil service, Burdwan, | 1857 |
| Reid, Major David, (Executive Officer,) Debrooghur, | 1851 |
| Reid, F., Esq.. Supt. of Irrigation, Rohilkund, | 1858 |
| Richards,*† J., Esq., Merchant, | 1834 |
| Richardson, H. C., Esq., Civil service, Chuprah, | 1856 |
| Richardson, R. J. Esq., Civil service, Arrah, | 1859 |

Admitted.

Riddell, Col. C. J. B., C. B., Royal Artillery, Benares, .. .. 1858
Riddell,† H. B., Esq., Civil service, .. .. .. .. 1855
Rigby, Lt.-Col. Henry, (Engineers,) Punjaub, .. .. 1852
Ripley, Capt. F. W., (22nd Regt. N. I.,) Assist.-Commissioner of Arracan, Kyouk Phyoo, .. .. .. 1849
Ritchie,† W., Esq., Advocate-General, .. .. .. 1851
Roberts, J. B., Esq., H. M. Coroner for Calcutta, .. 1858
Robinson, S. H., Esq., Merchant, Calcutta, .. .. 1854
Robinson, T. M., Esq., Merchant, Calcutta, .. .. 1848
Rogers,† Captain T. E., .. .. .. .. .. 1843
Rogers, George, Esq., Solicitor, Calcutta, .. .. .. 1858
Roghé, A. W., Esq., Merchant, Akyab, .. .. .. 1859
Rome, James, Esq., Merchant, Calcutta, .. .. .. 1859
Rose,† Henry, Esq., Civil service, .. .. .. .. 1847
Rose, W. Grant, Esq., Merchant, Calcutta, *(Vice-President.)* .. .. .. .. .. .. .. .. 1837
Ross, Alexander, Esq., Civil service, Agra, .. .. 1858
Ross,† J. G., Esq., .. .. .. .. .. .. 1852
Ross, R. F., Esq., Merchant, Calcutta, .. .. .. 1855
Ross, Lieut. D. Adjt. 1st Assam Battalion, Debrooghur, . 1858
Ross,† Andrew Esq., C. S. Azimghur, .. .. .. 1859
Row, Capt. W. S., (33rd N. I.,) .. .. .. .. 1854
Rowlatt, Capt. E. A., Principal Assist.-Commr. of Assam, Kamroop, .. .. .. .. .. .. .. .. 1855
Ruffeeoodeen, Prince Mahomed, Russapuglah, near Tallygunge, .. .. .. .. .. .. .. 1851
Rummanauth Gossain, Zemindar, Serampore, .. .. 1857
Russell, A. E., Esq., Civil service, Balasore, .. .. 1847
Russell,† R. H., Esq., Civil service, .. .. .. 1855
Ryder, Lt. C. D., 2nd Gwalior Infantry, Jhansee, .. 1858

SAGE,† Col. W. (22nd Regt N. I.,) .. .. .. 1845
Sage, R. P., Esq., Chowkeedanga Collieries, Raneegunge, 1859
Sagore Dutt, Baboo, Merchant, Calcutta, .. .. .. 1850
Samuells,* Edwards A., Esq., Civil service, Calcutta, .. 1836
Sanders, Col. Arthur, Commg. Raneegunge Depot, .. 1859
Sandes,† Falkner C., Esq., Solicitor, .. .. .. 1855
Sandes,† M. F., Esq., .. .. .. .. .. 1851
Sandys, J. U., Esq., Allahabad, .. .. .. .. 1855
Sapte,† Brand, Esq., Civil service, .. .. .. 1851
Sarkies. P. J., Esq., Merchant, Calcutta, .. .. .. 1838
Sarkies, S. J., Esq., Serampore, .. .. .. .. 1854
Saubolle, C. A., Esq., Nopara, Kishnaghur, .. .. 1857
Saunders,† John O'Brien, Esq., .. .. .. .. 1856
Savi,† John Robert, Esq., Indigo-planter, .. .. .. 1836
Savi, Thomas, Esq., Indigo-planter, Kishnaghur, .. .. 1851
Schalch, Vernon, Esq., Civil service, Balasore, .. .. 1859

| | Admitted. |
|---|---|
| Schiller, F., Esq., Merchant, Calcutta, .. .. .. | 1854 |
| Schultz Carl, Esq., Singapore, .. .. .. | 1859 |
| Sconce, Archibald, Esq., Civil Service, Calcutta, .. .. | 1839 |
| Scott, Dr. D., Medical service, Delhi, .. .. .. | 1852 |
| Scott, Lieut. J. F. O., Adjt. Sylhet Light Infy.. Cherra, .. | 1858 |
| Scott, Lieut. Col E. W., Inspector Genl. of Ordnance, .. | 1859 |
| Secretary for the time being, Artillery Head Quarter Mess., | 1858 |
| Secretary Lucknow Public Garden, Lucknow, .. .. | 1858 |
| Secy Local Fund Committee, Umritsur, .. .. .. | 1859 |
| Secy Local Committee, Hummeerpore, .. .. . | 1859 |
| Seton-Karr. W. S., Esq., Civil service, Jessore, . .. | 1859 |
| Seymour, S. F , Esq., Admr. General's Office, Calcutta, .. | 1853. |
| Sham Churn Mullick, Baboo, Calcutta, .. .. .. | 1857 |
| Shamachurn Law, Baboo, Merchant, Calcutta, .. .. | 1855 |
| Shamchand Mittra, Baboo, Merchant, .. . .. | 1854 |
| Sharpe, the Reverend James, Chaplain, Mussooree, .. | 1843 |
| Shawe, M., Esq., Civil service, Sylhet, .. .. .. | 1842 |
| Shearin, E., Esq., Merchant, Calcutta, .. .. .. | 1856 |
| Sherriff, W., Esq., Jorrada, Jessore, .. . .. .. | 1859 |
| Shib Chunder Deb, Baboo, Deputy-Collector, Calcutta, . | 1847 |
| Shibkissen Banerjea, Baboo, Merchant, Calcutta, .. .. | 1850 |
| Shillingford, Jos., Esq., Indigo-planter, Purneah, . .. | 1853 |
| Sieveking, F. H., Esq., Engineers, E. I. Railway, Bhaugulpore, .. .. .. .. .. .. .. | 1857 |
| Simpson,† H., Esq , Indigo-planter, . .. .. | 1854 |
| Simson, James, Esq., Civil service, Mirzapore, .. .. | 1856 |
| Simson, D., Esq., Civil service, Oude, .. .. .. | 1854 |
| Sinclair,† Lieut. J. J. DeC., Artillery, .. .. .. | 1851 |
| Skinner, A., Esq., Hansi, .. .. .. .. .. | 1854 |
| Skinner, C. B., Civil service, Jessore. .. .. .. | 1856 |
| Skinner, Lieut. R. M., (56th, N. I.) Adjutant Military Police, Allyghur, .. .. .. .. .. .. | 1859 |
| Skipwith,† F., Esq., Civil service, .. .. .. .. | 1842 |
| Slade, James, Esq., Indigo-planter, Tirhoot, .. .. | 1855 |
| Small, James, Esq., Calcutta, .. .. .. .. | 1843 |
| Smith, Adam Hume, Esq., Indigo-planter, Jessore, .. | 1857 |
| Smith, † Edward,, Esq. Merchant, .. .. .. .. | 1841 |
| Smith, George, Esq., Indigo-planter, Tirhoot, .. .. | 1858 |
| Smith, Jas. White, Esq., Indigo-planter, Kattullee, Kishnaghur, .. .. .. .. .. .. .. | 1854 |
| Smith, Major E., Fleetwood, (23rd Regt. N. I.) Supdt. Keddah Establishment, Dacca, .. .. .. .. | 1852 |
| Smith,† Rev. Thomas, of the Free Church Institution, .. | 1857 |
| Smith, Samuel, Esq., Calcutta, .. .. .. .. | 1835 |
| Smith, W. M., Esq., Indigo-planter, Jutropore, Kishnaghur, | 1857 |
| Smith, Patrick, Esq., Indigo planter, Cossimpore Facty., Fureedpore, .. .. .. .. .. .. | 1859 |

Admitted.

Smith, J. Gow, Esq., Indigo-planter, Ruttenpore Factory, Kishnaghur, .. .. .. .. .. .. 1859
Smyth,† Capt. J. H., (Artillery,) .. .. .. .. 1851
Sonatun Bysack, Baboo, Calcutta, .. .. .. .. 1858
Soorauth Nauth Mullick, Baboo, Zemindar, Ishera, .. 1858
Sorodapersaud Roy, Baboo, Zemindar, Chukdiggee, Burdwan, .. .. .. .. .. .. .. 1857
Spears, Robert, Esq, Agriculturist, Golah Ghat, Upper Assam, .. .. .. .. .. .. .. 1855
Sreekissen Sing, Baboo, Calcutta, .. .. .. .. 1835
Staig, Charles S., Esq., Supt. E. I., Coal Company, Raneegunge, .. .. .. .. .. .. 1859
Stalkart, William, Esq., Merchant, Calcutta, .. .. 1845
Stanton, Lieut. F. S., (Engineers,) Shergotty, .. .. 1857
Steer, Charles, Esq, Civil service, Chittagong, .. .. 1853
Stephen, J., Esq, Dacca, .. .. .. .. .. 1855
Sterndale, R. A. Esq., Deputy-Collector, Seonee, .. .. 1859
Sterndale, W. C., Esq., Calcutta, .. .. .. .. 1856
Stevens, Major J., Invalid Establist, Dehra Doon, .. 1854
Stevenson.*† William, Esq., Junior, M. D., .. .. 1834
Stewart, C. B., Esq., Merchant, Calcutta, .. .. .. 1854
Stewart, Lt. R, (22nd N. I.) Supt. of Cachar, .. .. 1856
Stewart,† Wm.. McAdam, Esq. Merchant, .. .. 1851
Stewart, W. M., Esq., Dulsing Serai, Tirhoot, .. .. 1859
Story, Major-General, F P, C. B., Cawnpore, .. .. 1854
Strachey, Lt-Col. R., (Engineers,) Calcutta, .. .. 1857
Stuart,† James, Esq., Merchant, . . . .. 1847
Sumbonauth Pundit, Baboo, Pleader, Sudder Court, Calcutta, .. .. .. .. . .. .. 1853
Sutherland, Charles J, Esq, Merchant, Calcutta, .. .. 1838
Sutherland, Dr. John, Civil Surgeon, Patna, .. .. 1859
Sutish Chunder Roy, Rajah of Nuddea, Kishnaghur, .. 1857
Suttochurn Ghosal, Rajah, Bahadoor, Calcutta, .. .. 1856
Swatman,† Lt.-Col. Wm., (3rd European Regt,) .. .. 1845
Swinden, T. G., Esq., Calcutta, .. .. .. . 1855
Swinhoe, William, Esq., Attorney, Calcutta, .. .. 1859

Tayler, W., Esq., Patna, .. .. .. .. .. 1853
Talyor, G. B., Esq., Benares, .. .. .. .. 1858
Taylor, W. C., Esq, Assist-Comr., Sonthal Pergunnahs, Nya-Doomka, .. . .. .. .. .. 1858
Teil, Thos., Esq., Merchant, Calcutta, .. .. .. 1855
Terry, W., Esq, Indigo-planter, Midnapore, .. .. 1846
Thelwall, Capt. J. B., (H. M. 4th Regt.) Com. 9th Punjab Infantry, Fyzabad, .. .. .. .. 1851
Theobald,† W. Esq., Barrister-at-law, .. .. .. 1855
Thomas,† J. P., Esq. Merchant, Calcutta, . .. .. 1852

*Admitted.*

Thomas, R. M., Esq., Solicitor, Calcutta, .. .. .. 1849
Thomas, Col. Charles Thynne, Dehra-Doon, .. .. 1858
Thompson,† George, Esq., .. .. .. .. .. 1856
Thompson, Capt. E., Deputy-Com. Seetapore, Oude, .. 1859
Thomson, Thomas, Esq., M. D., Supt. Royal Bot. Garden, Calcutta, (*President*,) .. .. .. .. .. 1855
Thomson, William, Esq., Merchant, Calcutta, .. .. 1848
Thomson, William, Superintending-Surgeon, Dacca, .. 1859
Thorp,† E. C., Esq , M. D , Assist.-Surgeon, .. .. 1857
Townsend, M. W., Esq , Serampore, .. .. .. 1858
Travers,† Lt.-Col. J., (2nd Grendrs.,) . .. .. 1854
Trevor, Edward Tayler, Esq., Civil service Calcutta, .. 1840
Tripp, H. D., Esq., Indigo-planter, Salgumudea, Commercolly, .. .. .. .. .. .. .. 1852
Trotter, T C , Esq , Civil service, Patna, .. .. .. 1856
Tucker,† Henry Carre, Esq., Civil service, . . .. 1837
Tucker, Henry Carre, Esq., or Secy. for the time being, Local Committee, Allahabad, .. . .. .. 1851
Tucker, W. T , Esq., Civil service, Monghyr, .. .. 1855
Tuckerman, N. C., Esq., Merchant, Calcutta, .. .. 1856
Turnbull, C. S, Esq., Silk manufacturer, Ghuttal . .. 1859
Turnbull, G. D., Esq , Civil service, Meerut, .. .. 1853
Turnbull, Lieut. A. D., (Bengal Engineers,) Supt. Genl. of Irrigation, N. W. P., Roorkee, .. .. .. 1851
Turner,*† Thos. Jacob, Esq , Civil service, .. .. .. 1836
Tweedie, Maurice, Esq , Indigo-planter, Buzunghaut factory, Kishnaghur, .. .. .. .. .. 1858
Twemlow,† Brigadier George, (Nizam's Army,) .. .. 1843
Twynam, Lt. E. J. L , Executive Officer, Arracan, Akyab, .. .. .. .. .. .. .. 1856

UTTERSON,† Lieut. E. V., (27th Regt N. I.,) .. .. 1854

VARDEN, A. M., Esq , Merchant, Calcutta, .. .. 1851
Vertue, Lieut J. S., (Madras Engineers,) Vizagapatam, .. 1859
Vetch,† Col. H., (54th Regt. N. I.) .. .. .. 1842
Vincent, Capt. F. F., 30th Regt. N. I. Calcutta, .. .. 1859
Vincent, E. L., Esq , Civil Engineer, Monghyr, .. .. 1859
Vincent,‡ W., Esq , Bordeaux, .. .. .. .. 1841
Vizianagram, His Highness the Rajah of, .. .. .. 1847
Vos, J. M., Esq., Assessor of House Tax, Calcutta, .. 1847

WAGENTRIEBER, W., Esq , Tea planter, Debrooghur, .. 1857
Walker, Alexander, Esq , Merchant, Calcutta, .. .. 1855
Wallace,† A., Esq., Merchant, .. .. .. .. 1843
Wallis,† J. J., Esq , Merchant, .. .. .. .. 1856
Walters,*† Henry, Esq , .. .. .. .. .. 1836

*Admitted.*

Ward, J. D., Esq , Civil service, Jamalpore, .. .. 1857
Ward, J. J., Esq., Civil service, Cuttack, .. .. .. 1852
Warner, J. E , Esq , Indigo-planter, Baraset, .. .. 1856
Warwick, B., Esq.. Merchant, Calcutta, .. .. .. 1849
Waterfield, E., Esq., Civil service, Balasore, .. .. 1846
Watson, Hartley, Esq., C. E., E. I. Railway, Monghyr, .. 1858
Watson,† John, Esq , Merchant, .. .. .. .. 1852
Watson,*† Robert, Esq., .. .. .. .. .. 1837
Watson,† T. J., Esq., Merchant, .. .. .. .. 1854
Wauchope, S., Esq , Civil service, Calcutta, .. .. 1848
Wavell, Wm. Esq. Civil service, Pooree, .. .. .. 1859
Weinholt, John, Esq , Merchant, Calcutta,.. .. .. 1859
Weld, Lieut. Geo., Fort Adjutant, Chunar, .. .. 1856
Wemyss, Sir John, Bart., Berhampore, .. .. .. 1859
Weskins, Charles, Esq., Merchant, Calcutta, .. .. 1854
West, C. H., Esq., Merchant, Lahore, .. .. .. 1850
Western,† Major J R., (Engineers), .. .. .. 1842
Whampoa, Mr., Merchant, Singapore, .. .. .. 1850
Wienbolt,† W., Esq., Merchant, .. .. .. 1848
Wight,*† Robert, Esq , M. D., Madras Medical service, .. 1836
Wigram, R. J., Esq , Civil service, Chuprah, .. .. 1856
Williams, Fleetwood, Esq , Civil service, Meerut, .. .. 1840
Williamson, Lieut. James, Commandant 18th Regt. Punjab N. I., Peshawur, .. .. .. . .. .. 1849
Williamson, Geo., Esq., Cumamara Tea Factory, Jorehaut, Assam, .. .. .. .. .. .. .. 1858
Williams, J., Esq., Meeywar Agency, Neemuch, .. .. 1859
Willis, Joseph, Esq. Merchant, Calcutta, .. .. .. 1827
Willock,† H. D , Esq , Civil service, .. .. .. 1855
Willocks, W., Esq., Deputy-Supt. Eastearn Jumna Canals, Barauth, near Delhi, . .. .. .. .. 1857
Wilmer, Lt. L. W., 90 Lt. Infy, Seetapore, Oude, . .. 1859
Wilmot, C. W., Esq., Assist. Commissioner, Southal Purgunnahs, Pakour viâ Jungypore, .. .. .. 1859
Wilson, A. G., Esq , Deputy-Magistrate, Gyah, .. .. 1847
Wilson, I , Esq., Barrister, Calcutta, .. .. .. 1858
Wilson, Thomas, Esq., Deputy Opium Agent, Ghazeepore, 1848
Wilsone, C. M., Esq., Indigo planter, Munglepore. .. 1853
Wingrove,† E., Esq , Merchant, .. .. .. .. 1846
Wingrove,† G. W., Esq , Merchant, .. .. .. 1856
Wingfield, C. J., Esq., Civil service. Lucknow, .. .. 1855
Wintle, Charles F., Esq , Sub.-Deputy Opium Agent, Futtehpore, .. . . .. .. .. .. 1859
Wise, Thomas Allen, Esq., Donigara, Dacca, .. .. 1859
Withecombe,† J. R., Esq., Medical service, .. .. 1851
Wood, C. B., Esq , Merchant, Calcutta, .. .. .. 1856
Wood, J. N. T , Esq , Merchant, Calcutta, .. .. 1854

*Admitted.*

Wood, R. A., Esq, Indigo-planter, Khabulpore, Kishnaghur, .. . .. .. .. .. .. 1858
Worsley, J. T., Esq, Deputy-Magistrate, Nowada,* .. 1859
Wray, G. O., Esq., Solicitor, Calcutta, .. .. .. 1857
Wright, H., Esq, Shahpore, Punjab, .. .. .. 1854
Wylie, Macleod, Esq., Clerk to the Legislative Council, Calcutta, .. .. .. .. .. .. .. 1844

Young, James H. Esq, Civil service, Burdwan, .. .. 1857

# BYE-LAWS.

## CHAPTER I.

### Object.

The promotion and improvement of the Agriculture and Horticulture of India constitute the object of the Society.

## CHAPTER II.

### Constitution.

The Society consist of Members, Honorary and Corresponding Members, and Associates.

## CHAPTER III.

### Proposal and Election of Members.

*Section* 1.—Persons of every nation shall be eligible as Members of the Society

*Section* 2.—Candidates for admission as Ordinary Members shall be proposed by two Members at a General Meeting, and ballotted for at the succeeding Meeting, when a majority of votes shall determine the election.

*Section* 3.—Persons so elected shall have immediate notice thereof transmitted to them by the Secretary, accompanied by a copy of the Bye-Laws.

*Section* 4.—Ordinary Members shall pay an admission fee of 8 Rs , and the same sum quarterly, in advance, (commencing from the quarter of the year in which they are elected,) so long as they continue resident in India. It shall be optional for any Member to compound for the quarterly contributions by the payment of Rs. 320 to the funds of the Society.

*Section* 5.—The payment of the admission fee shall be considered as distinctly implying the acquiescence of every Member elected into the Society in all the Rules, Regulations, and Bye-Laws thereof. A Member retiring from the Society shall be exempted from the payment of a second admission fee on re-election.

*Section* 6.—Members whose absence from India shall not extend beyond four years, shall continue to be borne on the list of Members,

but shall be exempt from the payment of subscriptions until their return to the country.

*Section* 7.—When any Member shall be in arrear of his annual contribution, or otherwise indebted to the Society for more than one year, he shall be apprised by letter, addressed to his last known place of residence, that unless the amount due by him be paid within six months of the date of notice, his name shall be removed from the list of Members; and in the event of his omitting to pay the amount within the time limited, his name shall be removed accordingly, and published in the proceedings of the Society as a Defaulter.

*Section* 8.—Ladies may be admitted as Members upon the same terms, and under the same regulations in all respects, as Gentlemen.

## CHAPTER IV.

### Withdrawal of Members.

*Section* 1.—Any Member may withdraw from the Society by intimating his wish to do so by letter addressed to the Secretary, without continuing his subscription beyond the quarter of the year in which his resignation is sent in; subject nevertheless to his name being published among the Defaulters (as per Section 7 of Chapter III.) if his arrears of subscription, or other debts to the Society, are not paid.

*Section* 2.—A resigning Member shall be at liberty to withdraw his letter of resignation, on payment of arrears, without going through the form of re-election; provided such notice of withdrawal be given during the year in which the resignation has been notified.

## CHAPTER V.

### Privileges of Members.

*Section* 1.—The Members have the right to be present and to vote at all General Meetings; to propose Candidates for admission into the Society as Members, as also to have personal access to the Museum, Library, and Garden of the Society, and to introduce visitors at the Ordinary Meetings.

*Section* 2.—Members shall be entitled to a share of all seeds purchased by, or presented to the Society; they can indent, at least once a year, on the Society's Garden for plants; they shall also be entitled to a copy of the Society's *Journal*, published subsequently to their election, and to previously published volumes, on payment of the cost charges.

*Section* 3.—Members in the country applying for seeds shall distinctly state to whose care such seeds are to be delivered in Calcutta, or how otherwise they are to be forwarded: the Society cannot despatch them at its own expense.

*Section* 4.—Only Members actually resident in India shall have claims upon the Society's Garden, or seeds imported by the Society, or copies of the *Journal*, unless they continue their subscriptions while abroad.

*Section* 5.—Members resident in Calcutta and its suburbs, whose subscriptions are in arrear, shall be debarred from all the privileges above mentioned. The same rule is applicable to Members in the country, who are more than one quarter in arrear.

## CHAPTER VI.

### Of Honorary Members.

*Section* 1.—Honorary Members shall be persons eminent for their knowledge of, or encouragement given to Agriculture or Horticulture, or for services rendered to the Society.

*Section* 2.—Persons proposed as Honorary Members shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

*Section* 3.—Honorary Members shall be exempted from the payment of fees and contributions; and they shall be entitled to all the privileges of Ordinary Members.

*Section* 4.—No Office-Bearer of the Society shall, in future, be eligible as an Honorary Member during his tenure of office.

## CHAPTER VII.

### Of Corresponding Members.

*Section* 1.—The Corresponding Members of the Society shall be constituted of such persons, not resident in Calcutta, or within one hundred miles thereof, as may show a willingness to promote the objects of the Society.

*Section* 2.—Corresponding Members shall not be limited as to numbers; they shall have the privilege of attending the Meetings of the Society, but shall have no voice in the business; they shall receive such copies of the Society's *Journal* as may contain

their contributions, but shall not be entitled to receive seeds, plants, &c.

*Section* 3.—Persons proposed as Corresponding Members shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

## CHAPTER VIII.

### Of Associates.

*Section* 1.—Associates shall be persons well known for their practical knowledge of, or encouragement given to Agriculture or Horticulture, or for services rendered to the Society, but who are not likely to apply to become Ordinary Members.

*Section* 2.—Persons proposed as Associates shall be recommended by the Council, they shall be ballotted for like Ordinary Members, but three-fourths of the votes shall be required to determine their election.

*Section* 3.—Associates shall be exempted from the payment of fees and contributions: they shall have all the privileges of Ordinary Members, except that of voting at Meetings of the Society.

## CHAPTER IX.

### General Meetings.

The General Meetings to be held by the Society shall be of three kinds: lst, Annual—2nd, Ordinary—3rd, Special.

## CHAPTER X.

### Anniversary General Meeting, Election of Officers, Council, and Committees, Annual Report.

*Section* 1.—An Anniversary General Meeting shall be held in January of each year, for the election of Officers and Council for the ensuing year, for the nomination of the several Standing Committees, and to receive and hear read the Annual Report on the financial and general concerns of the Society.

*Section* 2.—The Officers shall consist of—

1 President.

4 Vice-Presidents.

(Two of whom shall always be Natives.)

1 Secretary.

1 Deputy-Secretary and Treasurer.

*Section* 3.—The President and Council shall, previous to the Meeting, nominate the persons whom they recommend for election as Office-Bearers and Council; and ballotting lists containing the names of the members recommended, leaving a blank column opposite for such alterations as Members may wish to make, shall be prepared one week before the day of election. A copy of the list shall be handed to each Member present at the meeting, and should he disapprove of any name or names, or be desirous of inserting some other name or names, he shall erase or insert accordingly.

*Section* 4.—The Chairman shall appoint two Scrutineers, not Members of the Council, to examine the lists and report the result to the Meeting.

*Section* 5.—In the event of a vacancy during the year in the list of Officers or Council of the Society, such vacancy shall be filled up for the remainder of the year on the recommendation of the Council, at the second Monthly Meeting after the occurrence of such vacancy.

*Section* 6.—With the exception of the President, Secretaries, and Treasurer, the Office-Bearers of the Society, after a tenure of office during two years, shall not be eligible for re-election till the expiry of twelve months.

*Section* 7.—The revision of the various Standing Committees shall also take place at each Anniversary Meeting, consisting of the following:—

Sugar Committee.
Cotton Committee.
Silk, Hemp, and Flax Committee.
Coffee and Tobacco Committee.
Oil and Oil-Seed Committee.
Grain Committee.
Implements of Husbandry and Machinery Committee.
Nursery Garden Committee.
Fruit and Kitchen Garden Committee.
Floricultural Committee.
Translation Committee.

*Section* 8.—The Council shall consist of the Office-Bearers and twelve Members.

*Section* 9.—No person shall hold at the same time more than one of the following offices: viz. President, Vice-President, or Secretary.

*Section* 10.—The Council shall elect from their own body, Sub-Committees of Finance and Papers, whose reports on all matters referred to them shall be submitted to the Council.

## CHAPTER XI.

### Ordinary and Special General Meetings.

*Section* 1.—Ordinary General Meetings shall be held at the Society's apartments, Metcalfe Hall, on the second Wednesday of every month throughout the year, at the hours of 4 P. M. from October to March, and at 4½ P. M. from April to September, unless circumstances should render it expedient in the opinion of the Council, or any General Meeting, to alter the day of the next General Meeting.

*Section* 2.—Strangers may be present at the Ordinary General Meetings, if introduced by Members, and their names given to the President for record.

*Section* 3.—The ordinary course of procedure at the General Meetings, shall be as follows :—

1. The proceedings of the preceding General Meeting shall be read and submitted for confirmation.
2. The names of the gentlemen proposed as Members at the last Meeting shall be announced for ballot.
3. Motions of which notice was given at the last Meeting shall be brought forward and disposed of.
4. Notice of motions shall be given for entry in the proceedings of the Meeting.
5. The names of gentlemen proposed as Members, shall be announced.
6. The various reports, &c., on questions referred to the Council, shall be submitted for consideration.
7. Papers and communications, received since the last Meeting, together with their respective presentations, shall be brought to notice.

*Section* 4.—Special General Meetings may be convened at any time, on a requisition to that effect to the President, signed by at

least six Members, who thereupon will call the same, through the Secretary, or Deputy-Secretary, by public advertisement in three of the newspapers of the Presidency. No Special Meeting shall take place without a month's previous notice being given, unless the case be urgent.

*Section* 5.—No stranger shall be permitted to be present at Special Meetings of the Society.

*Section* 6.—Notice of motion on questions of Finance, or other matters of importance, shall be given at a General Meeting preceding that on which the subject is to be disposed of, in order that Members who take an interest in the question may have an opportunity of expressing their assent or dissent; and no motion of which notice has not been given, shall be carried at the Meeting at which it is proposed, if any three Members present vote for its postponement.

*Section* 7.—Motions of which previous notice has been given shall take precedence of all others.

*Section* 8.—Mofussil Members shall have the privilege of voting on questions of which one month's notice is given, sending their votes, post-paid, to the Secretary, for record.

## CHAPTER XII.

### Council,—Powers and Duties.

*Section* 1.—The government of the Society and the management of its concerns are entrusted to the Council, subject to no other restrictions than are imposed by the Bye-Laws, and to no other interference than may arise from the decisions of the Members assembled in General Meetings.

*Section* 2.—The Council shall meet once at least in every calender month throughout the year, on such day or days as they shall deem expedient.

*Section* 3.—No Meeting of the Council shall be competent to enter on, or decide any business, unless three or more Members be present.

*Section* 4.—The Council may appoint persons, not Members of it, to be salaried Clerks or Servants, for carrying on the necessary concerns of the Society, and may define the duties to be performed

by them respectively, and may suspend any Clerk or Servant from office whenever it shall appear to them necessary: provided always, that such appointment or suspension shall be reported to the next General Meeting of the Members, to be confirmed or annulled as may be decided by such Meeting.

*Section* 5.—The Council shall present and cause to be read to the Anniversary General Meeting, a report on the general concerns of the Society for the preceding year. The Report shall state the income and expenditure, the receipts and disbursements, and the increase or the decrease of the Society during that year: and give an estimate in detail of the probable income and expenditure of the succeeding year.

*Section* 6.—The Council shall distribute seeds and plants to all public gardens, reporting their proceedings to the next Meeting of the Society. No other resolution of the Council for disposing of or pledging the funds or property of the Society to any amount beyond the current expences of the establishment, shall be acted upon, or be of any validity until confirmed by the Society.

*Section* 7.—The President, or in his absence one of the Vice-Presidents, or, in their absence, the senior Member, shall preside at every Meeting of the Council.

*Section* 8.—All questions shall be decided by ballot, on the demand of any Member present; and the decision of the majority shall be considered the decision of the Meeting.

## CHAPTER XIII.

### The Duties of the President and Vice-Presidents.

*Section* 1.—The business of the President shall be to preside at all the Meetings of the Society, and regulate all the proceedings therein: and generally to execute, or see to the execution of the Bye-Laws and Orders of the Society.

*Section* 2.—In case of the absence of the President from any of the Meetings, his place shall be filled by the senior Vice-President then present, and, in the absence of the Vice-President, by the senior Member present, who shall, for the time being, have all the authority, privilege, and power of the President.

## CHAPTER XIV.

### Of the Secretary and Deputy-Secretary.

*Section* 1.—The Secretary, or in his absence the Deputy-Secretary,* shall exercise a general inspection over the servants and the affairs of the Society, and shall see that the Bye-Laws and orders of the Society are executed: he shall also attend the Meetings of the Society, and read such papers as may be submitted.

*Section* 2.—The Secretary, or in his absence the Deputy-Secretary, shall sign all letters and papers emanating from the Society.

*Section* 3.—The Deputy-Secretary shall draw up the correspondence of the Society, and be in daily attendance at the Society's apartments during the usual office hours.

## CHAPTER XV.

### Of the Treasurer aud the Accounts.

*Section* 1.—The Treasurer shall demand and receive for the use of the Society, all moneys due by or payable to the Society, and shall keep full and particular accounts of all sums so received and paid.

*Section* 2.—The moneys as received shall be deposited in the Bank of Bengal; and when the surplus shall exceed Rupees 1,000, it shall be invested in Company's Securities, on behalf of the Society, in the name of the Government Agent for the time being.

## CHAPTER XVI.

### Of Committees.

*Section* 1.—Besides the Standing Committees (Section 7, Chapter X,) the Members assembled in General Meetings may appoint Committees to report on my special matter relating to the objects or concerns of the Society.

*Section* 2.—Every Committee shall cause minutes to be taken of its proceedings.

*Section* 3.—Every Committee may appoint its own Chairman and Secretary.

*Section* 4.—Any Member of any Committee, who shall be personally interested in any question before that Committee, shall withdraw during the consideration of and vote upon the same, and

* There is no Deputy-Secretary now.

shal not take part in any Report that may be drawn up upon the matter for submission to the Society.

*Section* 5.—The Secretary shall be, *ex-officio*, a Member of all Committees.

## CHAPTER XVII.

### Of the Publications of the Society.

*Section* 1.—The *Journal*, or other publications of the Society, shall be under the superintendence of the Council, and shall be printed from time to time, whenever a sufficient number of such papers as may be deemed of public utility have been collected to form part of a volume.

*Section* 2.—Contributors to the *Journal*, &c., shall be entitled to twenty-five copies of their papers.

## CHAPTER XVIII.

### Distribution of Prizes.

*Section* 1.—The distribution of prizes at the Periodical Vegetable and Flower Shows of the Society shall be undertaken by the President or senior Vice-president. In the absence of such Officer or Officers, the senior Member of the Committee, to whom the arrangements of the Show are entrusted, shall perform that duty.

*Section* 2.—The Council shall have the power of adopting from time to time any regulations for the management of the Shows that may seem to them expedient.

## CHAPTER XIX.

### Amendments of the Bye-Laws.

Amendments or alterations of the Bye-Laws, may be proposed at any Ordinary Meeting of the Society; they shall, with the assent of the majority of the Members present, be entered on the Minutes, and if ordered by the said majority to lie over for consideration, the President shall direct them to be read by the Secretary, and stated for discussion at the next General Meeting; and if three-fourths of the Members, provided that not less then eleven Members be present, shall vote in favour of adopting them, they shall be recorded as a part of the Bye-Laws.

BISHOP'S COLLEGE PRESS

Capital of any similar Society in India, and their rates have recently been carefully investigated by two eminent Actuaries in London (*viz.* Messrs. Peter Hardy and Charles Jellicoe), and are declared to be as moderate as is deemed consistent with perfect security to the Assured.

*2nd. One-fifth* of the ascertained profits of the *five preceding years* is divided *annually* between the Policy-holders and Shareholders—three-fourths to the former, and one-fourth to the latter. The remaining four-fifths are set apart to enter into the average of the succeeding years, and *thus to provide against unforeseen contingencies.*

It is most satisfactory to the Directors to state, that, *notwithstanding the unusual losses occasioned by the Mutinies in India,* the amount of profits declared on the last annual division, *viz.* in May, 1859, was *equivalent to a reduction of thirty-six per cent. on the original annual premium.*

*3rd.* The Tables of Premium have been framed with the greatest care, and those applicable to Indian lives have been deduced from actual, and reliable experience, obtained from the records of the India House.

*4th.* Proposals are received for Assurances for the whole term of life, either on the participating, or on a non-participating scale at a lower rate of premium. Also for short periods varying from one to seven years on the most moderate terms.

*5th* The following is an extract of the Rates of Premium for an Assurance of Company's Rupees One Thousand :—

## CIVIL.

| | One Year. | | Three Years. | | Five Years. | | Seven Years. | |
|---|---|---|---|---|---|---|---|---|
| Age. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. |
| | Rs. As | Rs. As. | Rs. As. | Rs. As. | Rs. As | Rs. As. | Rs. As. | Rs. As. |
| 20 | 11 0 | 5 8 | 11 0 | 5 8 | 11 8 | 5 12 | 12 0 | 6 0 |
| 30 | 13 8 | 6 12 | 14 0 | 7 0 | 14 0 | 7 0 | 14 8 | 7 4 |
| 40 | 16 0 | 8 0 | 16 0 | 8 0 | 16 0 | 8 0 | 16 8 | 8 4 |
| 50 | 19 0 | 9 8 | 20 0 | 10 0 | 20 0 | 10 0 | 21 8 | 10 12 |

# MILITARY.

| | One Year. | | Three Years. | | Five Years. | | Seven Years. | |
|---|---|---|---|---|---|---|---|---|
| Age. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. | Half-yearly. | Quarterly. |
| | Rs. As. | Rs. As. | Rs. As | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. |
| 20 | 13 0 | 6 8 | 13 8 | 6 12 | 14 0 | 7 0 | 14 0 | 7 0 |
| 30 | 16 0 | 8 0 | 16 0 | 8 0 | 16 8 | 8 4 | 17 0 | 8 8 |
| 40 | 19 8 | 9 12 | 20 0 | 10 0 | 20 0 | 10 0 | 20 0 | 10 0 |
| 50 | 22 8 | 11 4 | 23 0 | 11 8 | 23 8 | 11 12 | 24 0 | 12 0 |

Intermediate Ages in Proportion.

**The following is an extract of WHOLE LIFE rates:**

# CIVIL.

| Age. | With Profits. | | | | Without Profits. | | | |
|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | | Quarterly. | | Half-yearly. | | Quarterly. | |
| | Rs. | As. | Rs. | As | Rs. | As. | Rs. | As. |
| 20 | 21 | 0 | 10 | 8 | 16 | 0 | 8 | 0 |
| 30 | 24 | 0 | 12 | 0 | 19 | 8 | 9 | 12 |
| 40 | 29 | 8 | 14 | 12 | 24 | 8 | 12 | 4 |
| 50 | 37 | 0 | 18 | 8 | 31 | 0 | 15 | 8 |

## MILITARY OR NAVAL.

| Age. | With Profits. | | | | Without Profits. | | | | Annual English Rates. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | | Quarterly. | | Half-yearly. | | Quarterly. | | | | |
| | Rs. | As. | Rs. | As. | Rs. | As. | Rs. | As. | £. | s. | d. |
| 20 | 23 | 8 | 11 | 12 | 18 | 0 | 9 | 0 | 1 | 18 | 8 |
| 30 | 27 | 0 | 13 | 8 | 22 | 8 | 11 | 4 | 2 | 8 | 10 |
| 40 | 31 | 8 | 15 | 12 | 26 | 8 | 13 | 4 | 3 | 3 | 0 |
| 50 | 38 | 8 | 19 | 4 | 32 | 0 | 16 | 0 | 4 | 5 | 6 |

*6th.* On return of an Insurer to Europe, either for *a temporary or permanent residence,* and *without reference to the state of health on return,* subject however to notice being given at the London Office the Premium is reduced to the English rate, corresponding with the *age when the Assurance was originally effected;* and in the case of participating Policies, the profits are allowed on the *English rate of Premium,* whereby Indian Assurers can continue their Policies in England on *most favorable terms.*

*7th.* Military Officers holding Civil appointments are allowed to subscribe at the Civil rate of premium, on notice being given to the Agents of the Society.

*8th.* Premiums are payable either annually, half-yearly or quarterly, and, on certain conditions *monthly* and a grace of 28 days is allowed for such payments.

*9th.* Policies for the whole term of life, which have been in force for five years, will be purchased by the Society, or loans granted thereon to the extent of two-thirds of their estimated value

*10th.* Policies can be effected in this Office *free of charge,* and Medical Referees are remunerated by the Society by a fee of Ten Rupees for each report on lives proposed for Assurance with this Institution.

Tables of Rates, Forms and Instructions for effecting Assurances, can be obtained on application to the Secretaries, or to

| | |
|---|---|
| Messrs. WALTER SMYTH and Co., .. .. .. | *Dinapore.* |
| Messrs. HAMILTON, BROWN and Co., .. .. | *Mirzapore.* |
| Messrs. GREENWAY BROTHERS, .. .. .. | *Cawnpore.* |
| F. W. PLACE, ESQ., .. .. .. .. .. | *Agra.* |
| J. M. HAMILTON, ESQ, .. .. ... .. | *Allahabad.* |
| J. A GIBBONS, ESQ., .. .. .. ... | *Meerut.* |
| Messrs. MACKINNON, HALL and Co., .. .. | *Ghazeepore.* |
| H. DEAR, ESQ., .. .. .. .. .. | *Monghyr.* |
| A. CHRISTIAN, ESQ., .. .. .. .. .. | *Tirhoot.* |
| MANAGER LAHORE CHRONICLE PRESS, .. .. | *Lahore.* |
| H. SPENCER, ESQ., .. .. .. .. .. | *Mooltan.* |
| Messrs. SYME and Co, .. .. .. .. | *Singapore.* |
| S. N. GREENE, ESQ., .. .. .. .. .. | *Penang.* |
| Messrs. WALKER, BORRADAILE and Co., .. .. | *Hong Kong.* |

BRADDON AND CO.
*Agents and Secretaries.*

CALCUTTA, No. 14, STRAND,
*January*, 1860.

# Indian Rates of the Universal Life Assurance Society.

## TABLE No. 1.—CIVIL.

Annual Premium required for the Assurance of 1,000 Rs. for periods from One to Seven Years, on the Lives of Persons in the H. C. Civil Service and others not exposed to the hazards of Military and Maritime occupations *without participation* in the Profits of the Society.

| Age. | One year. | Two years. | Three years. | Four years. | Five years. | Six years. | Seven years. | Age. |
|---|---|---|---|---|---|---|---|---|
| 18 | 21 | 21 | 22 | 22 | 23 | 23 | 23 | 18 |
| 19 | 22 | 22 | 22 | 22 | 23 | 23 | 24 | 19 |
| 20 | 22 | 22 | 22 | 23 | 23 | 24 | 24 | 20 |
| 21 | 22 | 22 | 23 | 23 | 24 | 24 | 24 | 21 |
| 22 | 23 | 23 | 24 | 24 | 24 | 24 | 24 | 22 |
| 23 | 23 | 24 | 24 | 24 | 24 | 24 | 25 | 23 |
| 24 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 24 |
| 25 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 25 |
| 26 | 24 | 24 | 25 | 25 | 26 | 26 | 27 | 26 |
| 27 | 25 | 25 | 26 | 26 | 27 | 27 | 28 | 27 |
| 28 | 26 | 26 | 27 | 27 | 28 | 28 | 28 | 28 |
| 29 | 27 | 27 | 28 | 28 | 28 | 28 | 28 | 29 |
| 30 | 27 | 27 | 28 | 28 | 28 | 28 | 29 | 30 |
| 31 | 28 | 28 | 28 | 28 | 29 | 29 | 29 | 31 |
| 32 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 32 |
| 33 | 28 | 28 | 29 | 29 | 30 | 30 | 30 | 33 |
| 34 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 34 |
| 35 | 30 | 30 | 30 | 30 | 31 | 31 | 31 | 35 |
| 36 | 30 | 30 | 30 | 31 | 31 | 32 | 32 | 36 |
| 37 | 31 | 31 | 31 | 31 | 32 | 32 | 32 | 37 |
| 38 | 31 | 31 | 32 | 32 | 32 | 32 | 32 | 38 |
| 39 | 31 | 32 | 32 | 32 | 32 | 32 | 32 | 39 |
| 40 | 32 | 32 | 32 | 32 | 32 | 32 | 33 | 40 |
| 41 | 32 | 32 | 32 | 32 | 33 | 33 | 34 | 41 |
| 42 | 32 | 32 | 32 | 33 | 34 | 34 | 35 | 42 |
| 43 | 33 | 33 | 34 | 34 | 35 | 35 | 36 | 43 |
| 44 | 34 | 34 | 35 | 35 | 35 | 36 | 36 | 44 |
| 45 | 34 | 35 | 35 | 36 | 36 | 37 | 38 | 45 |
| 46 | 35 | 35 | 36 | 36 | 36 | 37 | 39 | 46 |
| 47 | 36 | 36 | 36 | 37 | 38 | 39 | 40 | 47 |
| 48 | 36 | 36 | 37 | 38 | 39 | 40 | 40 | 48 |
| 49 | 37 | 38 | 39 | 39 | 40 | 40 | 42 | 49 |
| 50 | 38 | 39 | 40 | 40 | 40 | 41 | 43 | 50 |
| 51 | 40 | 40 | 40 | 41 | 42 | 43 | 44 | 51 |
| 52 | 40 | 41 | 42 | 43 | 44 | 44 | 45 | 52 |
| 53 | 42 | 43 | 44 | 44 | 44 | 46 | 47 | 53 |
| 54 | 43 | 44 | 44 | 45 | 46 | 47 | 48 | 54 |
| 55 | 44 | 45 | 45 | 47 | 48 | 48 | 48 | 55 |
| 56 | 45 | 46 | 47 | 48 | 48 | 49 | 50 | 56 |
| 57 | 46 | 48 | 48 | 49 | 50 | 51 | 52 | 57 |
| 58 | 48 | 48 | 50 | 51 | 52 | 52 | 54 | 58 |
| 59 | 49 | 50 | 51 | 52 | 54 | 56 | 56 | 59 |
| 60 | 51 | 52 | 52 | 54 | 56 | 58 | 60 | 60 |
| 61 | 52 | 53 | 55 | 56 | 59 | 61 | 64 | 61 |
| 62 | 55 | 56 | 57 | 60 | 62 | 66 | 70 | 62 |
| 63 | 58 | 60 | 61 | 64 | 66 | 71 | 76 | 63 |
| 64 | 62 | 64 | 66 | 68 | 71 | 77 | 84 | 64 |
| 65 | 67 | 69 | 72 | 75 | 77 | 84 | 91 | 65 |

**** Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Table No. 1, Example.—A person aged 30, may by paying 27 Rs. secure 1,000 Rs. to his representatives, if his death should occur within *one year*; if within *five* years, by paying 28 Rs. annually, and if within *seven* years, by paying 29 Rs. per annum.

## Indian Rates of the Universal Life Assurance Society

### TABLE No. 2.—MILITARY AND NAVAL.

Annual Premiums required for the Assurance of 1,000 Rs. for periods from One to Seven years, on the Lives of Persons exposed to the hazards of Military and Maritime occupations, *without participation* in the Profits of the Society.

| Age. | One year. | Two years. | Three years. | Four years. | Five years. | Six years. | Seven years. | Age. |
|---|---|---|---|---|---|---|---|---|
| 18 | 25 | 25 | 25 | 26 | 26 | 27 | 27 | 18 |
| 19 | 26 | 26 | 26 | 27 | 27 | 28 | 28 | 19 |
| 20 | 26 | 27 | 27 | 28 | 28 | 28 | 28 | 20 |
| 21 | 27 | 28 | 28 | 28 | 28 | 28 | 28 | 21 |
| 22 | 28 | 28 | 28 | 28 | 28 | 29 | 29 | 22 |
| 23 | 28 | 28 | 28 | 29 | 29 | 30 | 30 | 23 |
| 24 | 28 | 28 | 28 | 29 | 29 | 30 | 30 | 24 |
| 25 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 25 |
| 26 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 26 |
| 27 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 27 |
| 28 | 30 | 31 | 31 | 32 | 32 | 32 | 32 | 28 |
| 29 | 31 | 32 | 32 | 32 | 32 | 33 | 33 | 29 |
| 30 | 32 | 32 | 32 | 32 | 33 | 34 | 34 | 30 |
| 31 | 32 | 32 | 33 | 33 | 34 | 35 | 35 | 31 |
| 32 | 32 | 33 | 34 | 34 | 34 | 36 | 36 | 32 |
| 33 | 33 | 34 | 35 | 35 | 36 | 36 | 36 | 33 |
| 34 | 34 | 35 | 36 | 36 | 36 | 36 | 37 | 34 |
| 35 | 35 | 36 | 36 | 36 | 37 | 37 | 38 | 35 |
| 36 | 36 | 36 | 36 | 37 | 37 | 38 | 38 | 36 |
| 37 | 36 | 37 | 37 | 38 | 38 | 39 | 39 | 37 |
| 38 | 37 | 38 | 38 | 38 | 39 | 39 | 40 | 38 |
| 39 | 38 | 39 | 39 | 39 | 40 | 40 | 40 | 39 |
| 40 | 39 | 39 | 40 | 40 | 40 | 40 | 40 | 40 |
| 41 | 40 | 40 | 40 | 40 | 40 | 41 | 41 | 41 |
| 42 | 40 | 40 | 40 | 41 | 41 | 42 | 42 | 42 |
| 43 | 40 | 40 | 41 | 41 | 42 | 42 | 43 | 43 |
| 44 | 41 | 41 | 41 | 42 | 43 | 43 | 44 | 44 |
| 45 | 42 | 42 | 42 | 43 | 43 | 44 | 44 | 45 |
| 46 | 43 | 43 | 43 | 44 | 44 | 44 | 44 | 46 |
| 47 | 43 | 44 | 44 | 44 | 44 | 45 | 45 | 47 |
| 48 | 44 | 44 | 44 | 45 | 45 | 46 | 46 | 48 |
| 49 | 44 | 45 | 45 | 46 | 46 | 47 | 48 | 49 |
| 50 | 45 | 46 | 46 | 47 | 47 | 48 | 48 | 50 |
| 51 | 46 | 47 | 47 | 48 | 48 | 48 | 49 | 51 |
| 52 | 47 | 48 | 48 | 48 | 49 | 50 | 50 | 52 |
| 53 | 48 | 48 | 49 | 49 | 50 | 51 | 52 | 53 |
| 54 | 49 | 49 | 50 | 51 | 52 | 52 | 52 | 54 |
| 55 | 50 | 51 | 51 | 52 | 52 | 53 | 53 | 55 |
| 56 | 51 | 52 | 52 | 53 | 53 | 54 | 55 | 56 |
| 57 | 52 | 53 | 53 | 54 | 55 | 56 | 56 | 57 |
| 58 | 53 | 54 | 55 | 56 | 56 | 57 | 58 | 58 |
| 59 | 54 | 55 | 56 | 57 | 58 | 60 | 60 | 59 |
| 60 | 56 | 56 | 57 | 59 | 60 | 62 | 64 | 60 |
| 61 | 57 | 58 | 59 | 60 | 63 | 65 | 68 | 61 |
| 62 | 60 | 60 | 61 | 64 | 66 | 69 | 73 | 62 |
| 63 | 62 | 64 | 65 | 68 | 69 | 75 | 80 | 63 |
| 64 | 66 | 68 | 70 | 72 | 74 | 80 | 87 | 64 |
| 65 | 71 | 73 | 76 | 78 | 80 | 87 | 94 | 65 |

**** *Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Table No. 2, Example.— A person aged 30, may, by paying 32 Rs. secure 1,000 Rs. to his representatives, if his death should occur within *one* year; if within *five* years by paying 33 Rs. annually, and if within *seven* years by paying 34 Rs. per annum.

# UNIVERSAL LIFE ASSURANCE SOCIETY.

## WHOLE LIFE.

| Age. | CIVIL. Table No. 3. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe. | CIVIL. Table No. 5. Annual Premiums required for the Assurance of 1,000 Rs. *without participation in profits, but with reduction of Premium on return to Europe.* | MILITARY AND NAVAL. Table No. 4. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe. | MILITARY AND NAVAL. Table No. 6. Annual Premiums required for the Assurance of 1,000 Rs. *without participation in profits, but with reduction of Premium on return to Europe.* | ENGLISH RATES. Annual Premium for assuring £100, for the whole of life, with participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 3 and 4. | | | ENGLISH RATES. Annual Premium for assuring £100, for the whole of life, without participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 5 and 6. | | | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 41 | 31 | 45 | 34 | 1 | 17 | 2 | 1 | 13 | 6 | 18 |
| 19 | 42 | 32 | 46 | 35 | 1 | 17 | 11 | 1 | 14 | 2 | 19 |
| 20 | 42 | 32 | 47 | 36 | 1 | 18 | 8 | 1 | 14 | 10 | 20 |
| 21 | 43 | 33 | 48 | 37 | 1 | 19 | 6 | 1 | 15 | 7 | 21 |
| 22 | 43 | 34 | 49 | 38 | 2 | 0 | 5 | 1 | 16 | 5 | 22 |
| 23 | 44 | 35 | 49 | 39 | 2 | 1 | 4 | 1 | 17 | 3 | 23 |
| 24 | 44 | 36 | 50 | 40 | 2 | 2 | 3 | 1 | 18 | 1 | 24 |
| 25 | 45 | 36 | 51 | 41 | 2 | 3 | 3 | 1 | 19 | 0 | 25 |
| 26 | 46 | 37 | 51 | 42 | 2 | 4 | 4 | 1 | 19 | 11 | 26 |
| 27 | 46 | 38 | 52 | 43 | 2 | 5 | 5 | 2 | 0 | 11 | 27 |
| 28 | 47 | 38 | 53 | 44 | 2 | 6 | 7 | 2 | 2 | 0 | 28 |
| 29 | 48 | 39 | 54 | 45 | 2 | 7 | 8 | 2 | 2 | 11 | 29 |
| 30 | 48 | 39 | 54 | 45 | 2 | 8 | 10 | 2 | 4 | 0 | 30 |
| 31 | 49 | 40 | 55 | 46 | 2 | 9 | 11 | 2 | 5 | 0 | 31 |
| 32 | 50 | 41 | 56 | 46 | 2 | 11 | 0 | 2 | 5 | 11 | 32 |
| 33 | 51 | 42 | 57 | 47 | 2 | 12 | 3 | 2 | 7 | 1 | 33 |
| 34 | 52 | 43 | 58 | 47 | 2 | 13 | 7 | 2 | 8 | 3 | 34 |
| 35 | 53 | 43 | 58 | 47 | 2 | 14 | 11 | 2 | 9 | 6 | 35 |
| 36 | 54 | 45 | 59 | 49 | 2 | 16 | 5 | 2 | 10 | 10 | 36 |
| 37 | 55 | 46 | 60 | 50 | 2 | 18 | 0 | 2 | 12 | 3 | 37 |
| 38 | 56 | 47 | 61 | 51 | 2 | 19 | 7 | 2 | 13 | 8 | 38 |
| 39 | 58 | 48 | 62 | 52 | 3 | 1 | 3 | 2 | 15 | 2 | 39 |
| 40 | 59 | 49 | 63 | 53 | 3 | 3 | 0 | 2 | 16 | 9 | 40 |
| 41 | 60 | 51 | 64 | 54 | 3 | 4 | 9 | 2 | 18 | 4 | 41 |
| 42 | 62 | 52 | 65 | 55 | 3 | 6 | 6 | 2 | 19 | 11 | 42 |
| 43 | 63 | 53 | 66 | 56 | 3 | 8 | 3 | 3 | 1 | 6 | 43 |
| 44 | 65 | 54 | 68 | 57 | 3 | 10 | 2 | 3 | 3 | 2 | 44 |
| 45 | 66 | 55 | 69 | 58 | 3 | 12 | 2 | 3 | 5 | 0 | 45 |
| 46 | 67 | 57 | 70 | 60 | 3 | 14 | 5 | 3 | 7 | 0 | 46 |
| 47 | 69 | 58 | 72 | 61 | 3 | 16 | 9 | 3 | 9 | 1 | 47 |
| 48 | 70 | 60 | 73 | 62 | 3 | 19 | 4 | 3 | 11 | 5 | 48 |
| 49 | 72 | 61 | 75 | 63 | 4 | 2 | 3 | 3 | 14 | 1 | 49 |
| 50 | 74 | 62 | 77 | 64 | 4 | 5 | 6 | 3 | 17 | 0 | 50 |
| 51 | 76 | 65 | 79 | 67 | 4 | 9 | 1 | 4 | 0 | 3 | 51 |
| 52 | 79 | 68 | 81 | 70 | 4 | 12 | 10 | 4 | 3 | 7 | 52 |
| 53 | 81 | 71 | 83 | 73 | 4 | 16 | 11 | 4 | 7 | 3 | 53 |
| 54 | 84 | 74 | 86 | 76 | 5 | 1 | 2 | 4 | 11 | 1 | 54 |
| 55 | 87 | 76 | 89 | 78 | 5 | 5 | 10 | 4 | 15 | 3 | 55 |
| 56 | 89 | 79 | 91 | 81 | 5 | 10 | 10 | 4 | 19 | 9 | 56 |
| 57 | 92 | 81 | 94 | 83 | 5 | 16 | 2 | 5 | 4 | 7 | 57 |
| 58 | 96 | 84 | 98 | 86 | 6 | 1 | 10 | 5 | 9 | 8 | 58 |
| 59 | 99 | 86 | 101 | 88 | 6 | 7 | 7 | 5 | 14 | 10 | 59 |
| 60 | 103 | 88 | 105 | 90 | 6 | 13 | 2 | 5 | 19 | 11 | 60 |
| 61 | 108 | 94 | 110 | 96 | 6 | 18 | 0 | 6 | 4 | 3 | 61 |
| 62 | 113 | 99 | 115 | 101 | 7 | 4 | 1 | 6 | 9 | 9 | 62 |
| 63 | 118 | 104 | 120 | 106 | 7 | 9 | 11 | 6 | 15 | 0 | 63 |
| 64 | 124 | 109 | 126 | 111 | 7 | 16 | 7 | 7 | 1 | 0 | 64 |
| 65 | 131 | 114 | 133 | 116 | 8 | 3 | 7 | 7 | 7 | 3 | 65 |

*** *Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Parties assured in Company's Rupees in India, who may determine on paying their future premiums in England, will be required to pay them at the fixed rate of Exchange of Two Shillings per Company's Rupee; and in the event of such assurance becoming a claim payable in England, the sum assured will be paid at the same fixed rate of Exchange of Two Shillings per Company's Rupee.

**The attention of Members is particularly requested to the recent alteration in Section 5, of Chapter V, of the Bye-Laws, which will be found at the end of this number of the *Journal*.**



# THE JOURNAL

OF THE

# Agricultural & Horticultural Society

OF

# INDIA.

---

*A few Remarks on Canals for India; primarily for Irrigation, secondly for Navigation, but principally regarding their advantages in Shahabad and Behar, and in the districts of Benares and Ghazeepore South of the Ganges: By* R. W. Bingham, *Esq., of Chynepore.*

Few sayings have been more widely spread throughout the civilized world, than that which has universally attested to the riches of Hindostan. It has become trite. I am not now going to discuss again what has long ago been settled, doubtless to their own satisfaction, by abler men than myself, that India and Ceylon were the El Dorado of the ancients, and also one of the places called Tarshish* to which Solomon dispatched his ships from Ezion-Geber; as Scripture tells us: and the erection of Tadmor in the desert proves that that great king had an eye to the advantage to be obtained, and the wealth to be gained, by Eastern trade.

* The name of Tarshish has been claimed by Spain, but latterly appears to have been acknowledged to mean Cornwall and the Scilly Islands.

Herodotus, who wrote 444 years before our Era, says in Book Thalia, Section 106 "India, as I have already remarked, "is the last inhabited country towards the East, where "every species of bird, and of quadruped,—Horses only "excepted, are much larger than in any other part of the "world. Their horses are not so large as the Nisean horses "of Media.* They have also a great abundance of gold, "which they procure, partly by digging, partly from the "rivers, but principally by the method above described. "They possess likewise a kind of plant which, instead of "fruit produces wool of a finer and better quality than that "of sheep, of this the natives make their clothes."†

History also tells us that Alexander extended his conquests to the Beeas or Hyphasis, and his influence to the Ganges and the Soane; if we are to accept the hypothesis that the Palebothra of the Greeks was situated at the place of the confluence of that river with the Ganges, somewhere near the site of the present city of Patna; and I see no reason why we should not, as every probability is in its favour, and therefore, in that case, the Græco-Bactrian and Indo-Scythian empires (which are now again plunged in worse than their primeval barbarism,) were enriched by being made the highway of Indian commerce with the West: of which the *tree wool* mentioned by Herodotus, and its

* Certainly not, if the common country tattoo may be taken as a specimen of the aboriginal breed: which in all fairness is probable: the improved breeds being due to the Mussulman conquerors.

† He says gold was taken by the Indians from the nest of a species of ant "not so large as a dog, but bigger than a fox, "and Pliny corroborates the "story, by saying," In the country of the northern Indians, these ants cast up "gold from holes within the earth. In colour they resemble cats, and are as "large as the wolves of Egypt. This gold which they throw up in winter; "the Indians contrive to steal in the summer, when the ants on account of "the heat contrive to hide themselves under ground." This is a wonderful story, but has at least the merit of trying to account for the riches of the East. Some Indian rivers however still produce gold, and one at least, the Soane, (from Sôn) has received its name from the circumstance.

products, would doubtless form a very large portion; as well as "apes and peacocks."

The merchants of Tyre and Sidon, and after them those of Carthage, knew their way to the East, and it is possible, nay extremely probable, that the gorgeous Cleopatra, that mistress of Cæsars, occasionally in the sultry days of an Egyptian summer, clothed herself and her maidens from the products of the looms of Dacca and Masulipatam, the muslins and chintzes of which had by that time become famous.

Marco Polo is not a myth, and his countrymen, the successors of the Tyrians, the Sidonians, the Carthaginians, and the Romans, in the empire of the seas:—the proud republics of Genoa and Venice—both looked to the East, and probably drew from thence many of the arts which now enrich Europe, amongst which we may fairly name, muslins, kincobs, chintzes, velvets, silks and satins, and perhaps glassware, all of which were indigenous to India. After them the Portuguese and Hollanders strained every nerve for Eastern trade, and, at a later date England and France entered the arena, all spurred forward by their belief in that trite old saying, that "the riches of the East were untold."

Thus we find that the belief in the extreme richness of India has been constant from before the time of western civilization and greatness, and that in consequence it has been the constant prey of conquerors from the west and north-west until modern times, when the fleets of Europe all came from the South.

India has no machinery, and in the European sense of the word no manufactures; when I say no manufactures, I mean none for export, for her cotton manufactures do not meet the local wants of her own people. Her sugar manufactures are only to a limited extent: and her indigo manufacture is almost wholly in the hands of Europeans;

however the two latter will come under the head of productions, not of manufactures, so that the assertion that India has no manufactures is borne out by facts; then whence, again I ask, the tradition of her reputed wealth? Fortunately we are enabled to find some reason for the report, in the multiplicity and value of the vegetable productions (her mineral ones yet remain to be developed,) of her soil; which comprise almost every thing required by man in his need, in his luxury, and in his pride. Possessing a compound of all climates, from the temperate to the torrid, yet all under the influence of an Indian sun, and a soil in consequence of unbounded natural fertility, she has thus been enabled, with all her disadvantages, to claim for herself the title of the garden of the world: and, in spite of the indolence and apathy of her people,—their absolute want of all knowledge of, and implements for, what Europeans and Americans call agriculture;—the deep poverty into which her masses are plunged;—and the crimes of the rulers who have swayed her destinies for the past two thousand years; and to prove it just sufficiently to shew what she might still become, if her natural resources were developed by good government, combined with a judicious system of irrigation and internal communication: and it will be the object of the following pages to shew partially how these resources may be brought to account; and also to shew that her former rulers, in spite of their tyranny and extortion: and her people, in spite of their apathy, indolence, and poverty, knew something of the secret.

Manu, the earliest Indian lawgiver of whom we have any account; and who may be said to have been at once the Solon, the Draco, and the Lycurgus of India, shewed how he appreciated the benefits of irrigation in his day: when probably it was less needed than at present; not having so dense a population to support; as we find in his code these pregnant words: "The breaker of a dam to secure

a pool, let the king punish by long immersion under water."

This probably refers to the Zemindarree bunds, which are literally *dams to secure a pool,* and also to earthen dams or weirs across petty streams or small rivers. However this may be, he left sufficient latitude in the punishment to meet all cases, as the punishment of immersion, might be continued sufficiently long to insure death :—it leaves a power in the hands of the king or ruler to inflict punishment according to the amount of damage done; from that of simple, or repeated immersion, which could be so managed as to cause intense torture, to death by drowning. The Hindoo landholders of the present day do not consider the punishment ordered by Manu a wit too severe, but would (were it not for the dread of our laws) inflict perhaps a more severe punishment still upon the dam-breaker. The passage quoted is however further significant; as shewing that so far back as the time of this ancient lawgiver, dams *were* made to secure a pool : and laws *were* made for their preservation, consequently irrigation from Canals, or from artificial reservoirs must have been common.

Some of the irrigation dams constructed in Ceylon, and many of which probably bear a date at least as far removed from us as that of Manu, far surpass in magnificence, even in their ruins, any thing that we have constructed. I have repeatedly heard officers who have served in Ceylon; and who through being sportsmen became acquainted with its interior, speak enthusiastically of some of these works, which they called Cyclopean. Sir Emmerson Tennent also gives the former rulers of Ceylon great praise for their untiring and gigantic efforts to promote the full irrigation of their country, and mentions several enormous dams or weirs, for the collection of the spare water from the hills, one in particular across a valley wholly constructed of stone being no less than sixteen miles in length. What a noble lake

that dam must have formed behind it; and what an extent of country its waters must have fertilized. All honor then be paid to the memory of these former rulers of Lunka:* be they Rams or Rawuns, they were wiser in their day and generation in this matter than we, who profess to a higher state of civilization, and fully knew the value of artificial irrigation in this torrid clime.

The Chinese Emperors also barbarians, as we are apt to call them, have excavated canals to which our great boast, the Ganges Canal, must yield, both in length and usefulness, as we find *one,* the Imperial canal, *seven hundred miles long and two hundred feet wide,* connecting the Eu Ho with the Hoang-ho, and that with the Yang-tse-kiang at Ching-keang-fow, where the line is again taken up with the Great Canal, which empties itself into the bay of Tsein-long-kiang.

But why enumerate the Canals of China? Every river and every lake sends forth its irrigation ducts to water the flowery land; and the single fact that no Chinese picture, even on their porcelain, is complete, without its lake, its canal, its bridge, or its fountain, shews the value in which water is esteemed in that empire, and were it not so, the land could not support its teeming millions.

The monarchs of Babylon and Assyria: the rulers of Mesopotamia (from the time when Abraham digged a well,) in the land of the Tigris and Euphrates, intersected the country with canals, and the land was a garden:—the drying up of these ancient watercourses is rapidly making the country a howling desert:—and bringing the prophecies respecting it to pass; but even now the extent of country from Bagdad to Bosrah is tolerably well watered.

Egypt owes all her fertility to the annual overflowings of the Nile, and to the stores of water which are conveyed across the cultivated land by canals under Government

* Native name for Ceylon.

management; rude if you will, but still sufficiently practical, to keep back the sands of the Lybian deserts, from burying the land of the Pharaohs entirely, as they have in many instances buried their monuments. Every oasis in the Lybian deserts and the Sahara, and the wadis of Arabia, owe their fertility, and their herbage, to the springs for which they are famed; and even the mysterious and deserted city of Petra was found by Burkhardt and Stevens to be rich in water supply, the channels of which may again diffuse fertility, when the curse is taken off the land, and the spears and swords of the Bedouin are turned into ploughshares and reaping hooks.

Mahomed Ali turned his earnest attention to the irrigation and fertilizing of his country, and constructed several canals for the purpose in Upper Egypt; by French Engineers, and the present Pasha is following in the same career. Egypt may still have a future.

Even in Peru, at the time of the Spanish conquest, (a country with an entirely different type of civilization to any we know of in the old world, and whose people did not know the use of iron) we are told by Prescott, the American historian, in Chapter IV of "The Conquest," that:—

"Much of the country along the sea-coast suffered from "want of water, as little or no rain fell there, and the few "streams in their short and hurried course from the mountains exerted only a very limited influence on the wide "extent of territory. The soil, it is true, was for the most "part sandy and sterile, but many places were capable of "being reclaimed, and indeed needed only to be properly "irrigated to be capable of extraordinary production. To "these spots water was conveyed by means of canals, and "subterraneous aqueducts, executed on a noble scale. "They consisted of large slabs of freestone, nicely fitted "together without cement; and discharged a volume of

"water sufficient, by means of latent ducts or sluices, to "moisten the lands in the lower level through which they "passed. Some of these aqueducts were of great length; "one which traversed the district of Condesuyu, measured "between four and five hundred miles in length. They "were brought from some elevated lake, or natural reservoir "in the heart of the mountains, and were fed at intervals "by other basins, which lay in their route along the slopes "of the sierra.* In this descent, a passage had sometimes "to be opened through rocks, and this without the aid of "iron tools; impracticable mountains were to be turned, "rivers and marshes to be crossed, in short the same obstacles "were to be encountered as in the construction of their "mighty roads. But the Peruvians seemed to take plea-"sure in wrestling with the difficulties of nature. Near "Caxamarca a tunnel is still visible which they excavated "in the mountains to give an outlet to the waters of a lake "when these rose to a height in the rainy season which "threatened the country with inundation."

"Most of these beneficent works of the Incâs were suf-"fered to go to decay by their Spanish conquerors.† In "some spots the waters are still left to flow in their silent "subterraneous channels whose windings and whose sources "have been alike unexplored. Others, though partially "dilapidated, and closed up with rubbish and the rank vege-"tation of the soil, still betray their course by occasional "patches of fertility. Such are the remains in the valley "of Nasca, a fruitful spot, that lies between long tracts of "desert, where the ancient water-courses of the Incâs, "measuring four and five feet in depth, by three in width,

* This would almost appear as if it had been written as a description of *what will be* in Shahabad, Benares and Behar.

† Have the British conquerors of India nothing of the same kind to reproach themselves with? I fear much; nay, I fear old canal beds could be shewn neglected, even in Shahabad.

"and formed of large blocks of uncemented masonry, are "conducted from an unknown distance.

"The greatest care was taken that *every* occupant of the "land through which these streams passed, should enjoy "the benefit of them. The quantity of water allotted to each "was prescribed by law, and royal overseers superintended "the distribution, and saw that it was faithfully applied to "the irrigation of the ground."

How much wiser in their day and generation were these barbarian Incas of Peru, in whose dominions reading, writing, and the uses of iron were unknown, than the mighty and self-called civilized government of British India. The Incas of Peru were a conquering race as we are; but, like the Romans, they left their works as land-marks for time in the countries which they conquered.

Again in Chapter IV Prescott says—"Everywhere the "natural capacities of the soil were stimulated by a minute "system of irrigation, which drew the fertilizing moisture "from every stream and rivulet, that rolled down the decli-"vity of the Andes, while the terraced sides of the "mountains were clothed with gardens and orchards, that "teemed with fruit of various latitudes. The Spaniard "could not sufficiently admire the industry with which "the natives had availed themselves of the bounty of "nature, or had supplied the deficiency when she had dealt "with a more parsimonious hand."

What a magnificent picture this is, but then these Peruvian rulers were natives of the soil. Our rulers cannot realize the same feeling, for with a tyranny which throws that of the Venetian oligarchy into the shade; and with a short-sighted policy equal to that of Lycurgus, when he denied to his people the benefits of commerce with other nations, the British Indian Government has sternly forbidden any of its covenanted servants to have a proprietal interest in the soil. Until they have such an interest, they

cannot feel for the soil: they cannot understand it or appreciate its wants. Experience only maketh wise: and the government of India has decreed that to its servants experience shall be a sealed book. Yet it would be equally as wise that the English Government at home should forbid the Russels and the Peels,—the Derbys, Woods, and Argyles—the whole territorial aristocracy of Great Britain, from legislation, or from the functions of a Magistrate or justice of the peace, because they have an interest in the soil which they legislate for, and whose laws they administer, as that the governing classes in India should be precluded from gaining experience in the soil for which they legislate: and which laws they enforce. The time has long since passed when such degrading regulations were necessary—if indeed they ever were so,—and landed property now held by civilians, and by Europeans in general, would be a blessing not a curse to the country, by giving them ties to the country of their adoption, by placing the native sluggishness side by side with European energy and skill, and thus stimulating them in the path of progress, and by making our rulers feel, through that universal lever, self-interest, a desire that India should no longer be behind in the race of nations, but make amends for its past indolence by its present energy.

But we need not go out of India for proofs of the value placed upon irrigation. The former rulers of Hindustan, Hindoo or Moslem, warrior or saint, all knew how much the land benefited by the mighty fertilizing qualities of water:—many of their works are yet extant to speak for them.

The valley of the Indus, from Shikarpore to Hydrabad, shews *hundreds* of canals, drifted up, or only partially repaired by our government. The valley of Peshawur is intersected by small watercourses in every direction, taken from the rivers Cabul or Loonda, and the Khyber; and the

wild tribes of the frontier have more than once in former time, when their accustomed tribute has not been paid, enforced its payment by the stoppage of the water at the canal head. Cashmere owes its fertility to its complete system of irrigation, which the sovereigns of Jumboo avaricious as they are, keep in repair. The province of Mooltan, at the time of the conquest, was intersected by canals from the Chenab and the Sutledge, which made it a garden fitted to produce the wealth of Sawun Mull, which, even after the lavish expenditure of Dewan Moolraj in his rebellion, left an enormous plunder to his conquerors: while one of the greatest benefits our government has conferred on the Punjab, is the construction of new and repair of old canals, which the warlike dynasty of Runjeet Sing had neglected.* The Moslem conquerors of India

* What a contrast does the energy of the Punjab Government, and even that of the North-West Provinces, bear to the Government of Bengal. Bengal is our oldest province on this side of India, next we have Behar, yet both have been neglected, and nothing done for them: as even the Grand Trunk Road for 391 miles is only a means of communication with the North-West. Of internal improvement Bengal and Behar have none, except such as is the result of private enterprise, and our roads and canals remain to be made. Hear Sir Henry Elliott, when Foreign Secretary to the Government of India, when writing 12 years ago; Sir Henry says—after due laudation of the British Government—"I speak only with reference to "my own presidency—the North-West Provinces. Bengal is said to be a "quarter of a century behind it in every symptom of improvement, except "mere English education. To the North-West Provinces at least cannot be "applied the taunt, that we have done nothing compared with the Moham-"medan Emperors. With respect to roads, bridges, and canals, even here "in the very seat of their supremacy, we have hundreds of good district "roads where one never existed before; besides the 400 miles of Grand "Trunk Road, which is better than any mail road of similar extent in "Europe, and to which the Emperors never had any thing, in the remotest "degree, to be compared. The bridge at Jaunpur is the only one which can "enter into comparison with our bridge over the Hindun, and would suffer "greatly by the comparison;—to say nothing of those over the Júa, the "Khanant, and the Kali-nadi. In canals we have been fifty times more effec-"tive. Instead of wasting our supply of water on the frivolities of fountains,

have left behind them many striking works in the shape of irrigation canals and bunds. Mr. Battye, in his report on the Nujjuff-ghur Jheel works, near Delhie, dated the 8th April, 1848, says:—

"The remains of the immense bunds which are found "in many parts of the Delhi district, more particularly in "the southern pergunnahs, *most convincingly attest the atten-* "*tion paid* formerly to the subject of irrigation, and the "great labour and expence incurred, to secure it by means "of these embankments.

"Some of these bunds owe their origin to the enterprise "of village communities,—some to the munificence of indi- "viduals, and others to the native government—particularly "the Patan dynasties, who have left some immense works of "this description.

"Some are mere earthen embankments, others are "massive structures of masonry, in the construction of "which neither labour nor expence have been spared.

"The remains of 27 bunds have been found, and it is "supposed numbers more exist."

Again: Ferishta, as translated by Dow, says:—"In 755, "Feroze built the city of Ferozebad adjoining to that of Del- "hie, and in the following year marched to Delalpore, where "he made a canal 100 miles in length, from the Suttuluz* "to the Jujjur. In the year 757 between the hills of Men- "douli and Sirmoor, he cut a canal from the Jumna, which "he divided into seven streams, one of which he brought to "Hassi† and from thence to Beraisen, where he built a

"we have fertilized whole provinces, which had been barren from time "immemorial;—and this even on the lines of which *much had been markd* "*out by themselves;* leaving out of consideration the magnificent works in "progress in the Doab and Rohilkund.

"Finally, be it remembered, that six centuries more have to elapse before "any thing like a comparison can fairly be instituted. It is to be hoped we "shall not be idle during that long period."

* Sutledge. † Hansi

"strong castle calling it by his own name. He drew soon "after a canal from the Coggar* passing by the wall of "Sursutti, and joined it upon the rivulet of Kera, upon "which he built a city named after him Ferozeabad. This "city he watered with another canal from the Jumna. "These public works were of prodigious advantage to the "adjacent countries, *by supplying them with water for their* "*lands, and with a commodious water-carriage from place to* "*place.*"

And yet we call these people barbarians, and laugh when native dynastics are talked of. This old historian evidently shews that he appreciated the value of irrigation, and the power of carrying goods from place to place, which he must have learned in central Asia. In fact the Moslem dynasties of India, whether their motive may have been luxury or ostentation, from pride, or from a sincere desire to benefit their subjects, or to water their own parks and gardens, as has been sneeringly asserted by some, notoriously turned their attention to artificial irrigation, as the Shah Nahr at Lahore, Feroze Shah's canal at Delhie, Allee Murdan Khan's canal at the same place, the 27 bunds described by Mr. Battye, and numberless other instances, had we space to quote them, would prove.

Even Timour, the Tartar, the conqueror, legislates for them, and says in his institutes, "and I ordained whoever "undertook the cultivation of waste land, *or built an aque-* "*duct, or made a canal,* or planted a grove, or restored to "culture a deserted district, that in the first year nothing "be taken from him, and that in the second year whatso- "ever the subject voluntarily offered should be received, "and that in the third year the duties should be collected ac- "cording to the regulations." Thus we find even the warrior, the conqueror in the midst of his conquest, recognized the

* Cuggur or Guggur.

value of irrigation, and the feeling is not extinct, as even now, to build a temple or a mosque, plant a grove, erect a serai, dig a tank, or construct a well, are the most common ways in which the Hindoo or Moslem of Northern India shews his gratitude for favors received from his Maker, or, if childless, tries to perpetuate his name. It is unfortunate however that for want of instruction, or rather a certain length of leading-string, these wells and tanks are generally barren works, expensive to construct, but for irrigation purposes useless.

Let us now look at a few of the advantages of canals in India as paying speculations. I believe it is a well known fact, that the great Ganges, the Dooab, the Jumna, and the Punjab canals, all pay our Government, even on their expensive system of construction and extravagant and unbusiness-like system of management, a large surplus revenue; while the Madras commission of public works in their first report submitted to the Government of Madras, on the 23rd September, 1852, emphatically say, and they had every record open, and every facility afforded them for obtaining the most trustworthy information, whether from the musty holes of the Government secretariat, the papers of the Revenue survey, the record offices of Collectors, or from the plans and reports of engineers and fiscal officers; so that their report must be a trustworthy one—"We have seen that in the average of a considerable number of works, costing in the whole about five and a half lacks of rupees, the clear annual gain to Government has been 71 per cent on the outlay, but we will suppose that the return in revenue is much smaller, that it is no more than 25 per cent on the outlay (and there is a vast field for the expenditure of money on the formation of works which would pay more than that,) even on this supposition the profit is very great. It may safely be assumed, "that to every rupee of revenue paid to government, the

"total value produced is not less than $2\frac{1}{2}$, therefore an in-"crease of revenue to the amount of 25 per cent, represents "an increase of produce, in other words an addition to the "national wealth of $62\frac{1}{2}$ per cent on the outlay. Now when "it is remembered that of the total area of the Madras "territories, only one-fifth is cultivated; that of the whole "cultivation only one quarter is irrigated; that millions of "acres of good land require only water to make them richly "productive; and that immense volumes of water which "might be turned to this use, now flow waste into the sea: "when these facts are considered, some idea may be formed "of the vast extent of that field for improvement which is "before us." Again the same Commission report:—

"*The country is destitute of the means of transport; and "vast sources of wealth flow waste in our rivers, hence com-"merce languishes and industry is depressed.*" The italics are mine.

How true is the above paragraph which I have specially marked, those who know any thing of the internal commerce of India must be aware: and yet we have the easy means at hand to remedy these evils. I do not pretend to see further into the views of providence than other men, but it is now pretty generally acknowledged by philosophers, that where God has given a bane he has also given an antidote. He has given us in the greater portion of India a *dry*, hot and *arid* climate, which for five months in the year almost renders existence (without some artificial means to allay the extremity of the heat,) a burden, but He has at the same time given us the sweet smelling kus-kus root for our tatties, which, when placed before our doors and wetted with water, and by the assistance of the hot blasts passing, and cooling in their passage through them, renders the interior of our dwellings cool and pleasant. For this reason also He has given us abundance of rivers and streams, which although not navigable, yet furnish an unfailing supply

of water. And has He furnished these for nothing? No; He has given them for the use of man, so that man should turn them to his own use: and by the exercise of his mechanical skill spread these waters over a parched land, and from a desert produce a garden. We have seen the lands of the kings of Assyria, from neglect of these means, from gardens become desert again, and we have seen the sandy soil of the Dooab and the Punjab from their use become a garden, yet with all this experience we are coy to use the blessing which nature has spread bountifully before us. I do not believe in natural deserts. The Sahara, and the great Indian desert are both reclaimable, and will yet furnish food for millions: but as yet we have no pressing call to reclaim sandy wastes, let us hold our own provinces, and when we have used all the means to ensure their fertility, with which an all-bountiful Creator has supplied, we can then turn ourselves to harder tasks; in the mean time, no river in India, with exception of the great navigable lines, should be allowed to send their waters to the sea, without having first paid a tribute to the land. It may be urged that by using in this manner all the feeders, that the Ganges and Indus would be no more useful to navigation, but would only form at most fishing streams; but not so, the water would percolate from the land, and fill their channels as much as they are now filled by the contributions of the streams, and "Gunga would be herself again." The great Ganges Canal does not reduce her waters, except for a few miles below the canal head; while embankments, which will yet be made, by confining her stream into a better defined channel, will make them more manageable and more navigable, and by the spare waters of the affluent streams being retained in the rains for irrigation uses in the hot weather, would render the periodical floods less dangerous, and the hot weather stream, through percolation, more certain.

But to pursue the question of advantages, the Government of Madras, in a letter in the Public Works Department, No 28 of 1859, dated 8th July, to Lord Stanley, Secretary of State for India, gave cover to a Memorandum from the Commandant of Engineers, dated 18th May, 1859, in which we find the following remarks bearing on the subject:—

"*Para.* 11*th.*—That with so reasonable a prospect of large "returns, and of the vast benefits from irrigation and cheap "transit, economy of construction is by no means of so "much importance, compared with that of time of execu- "tion, as in such projects as afford more room for doubt "whether they will be profitable at all. If works can "scarcely be expected to yield 5 or 6 per cent, economy of "construction is every thing, and a year's loss of returns of "less moment, but if works yield 20 or 30 per cent, the loss "of a single year's returns is a great item, and the work "may be hastened through at an increased cost. The "aqueduct in Rajahmundry conveys water now to at least "45,000 acres,* yielding an increased produce in conse- "quence of 5 or 6 lacks a year, while that work only cost 3 "lacks. This seems so palpable a fact in confirmation of the "principle here urged, that I bring it forward here, but it is "only one of a multitude."

"*Para.* 7.—Of the effects of opening this vast and healthy "tract of country to foreign trade, an opinion can be formed "by what has taken place in Rajahmundry. The exports "of Coromjah before the works averaged 5¾ lacks, this last "official year they were 40 lacks, an increase of 34 lacks "(custom-house value) or of *actual* value about 45 lacks, and "this is almost entirely from the delta of the Godavery:

* Mr. Pelley, late Collector of Bellary, however reports that 1,000,000 acres would be irrigated: and Lieut. Fisher, Superintending Engineer of the district, estimates that 800,000 acres at least will be available: but as the error is on the right side, any further increase of irrigation above the 45,000 acres would be clear gain.

"an area of about 2,500 square miles. The proposed works "(Madras Irrigation Company) will open up 150,000 square "miles, or 60 times as much, and it therefore cannot be "estimated that a trade of less than 5 millions sterling "would spring up."

Colonel Cotton has also satisfactorily shewn what improvements may be effected, both in the revenue of the Government, and in the fertility of districts, by a judicious system of irrigation and navigation combined: but perhaps some of his plans, are too grand, too gigantic, and too costly for India in her present transition state, and I am of opinion that the bare contemplation of such grand and expensive works, (however useful they may be,) as proposed in some instances by Colonel Cotton and others, only deter our cautious, and pound-spending, penny-saving, unpractical Government, from undertaking many works which they otherwise would do, and they would be right if that was not made their excuse for doing nothing at all. We want the *utile* before the *dulce.*

India wants abundance of works: and all the energies of Government should be taxed for their construction, but she can do for awhile with canals of plain rough serviceable construction, on the American principle, and can well afford to wait for a quarter of a century, for sculptured or bronze collossal lions, sphinxes:—magnificent ranges of stone ghâts for Hindoo bathers, and other architectural and engineering extravagances of a similar nature:—nay may wait patiently without much loss or injury, for the completion of such magnificent conceptions as the Soane Railway Bridge, or the tunnel under the Indus at Attock, provided we can get plain and practical work in the mean time. We want first the necessaries of civilization in plain, but serviceable canals, plain and good roads, plain and substantial bridges over our rivers; and can wait for the luxury of magnificent works, architectural

adornment, and French polish, till we have got our necessary works done.

Because England with her plethora of wealth, her scientific applications, her gigantic manufacturing power, her control of steam, coal and iron, and her industrious, energetic, and teeming population, constructs Westminster Palaces, Britannia Bridges, Crystal Palaces, and Great Easterns, it is no reason that Indian Engineers should do the same; the circumstances, and the means of the two countries are entirely different. For my own part, (and I believe nine out of ten Anglo-Indians will agree with me,) I would prefer a corduroy road to no road at all, a wooden bridge *now* to waiting ten or twenty years for a masonry one, or a century for one of cut granite, earthen bunds for canal heads present, to waiting for marble or sculptured ones in the future, and fly boats and barges on the canals at once if we cannot have steam. Let us have progress, we cannot yet afford ostentation; it should be borne in mind that England can now afford to work for posterity: but we cannot spare the means to do so as yet: we must first feed ourselves. The constant endeavour to imitate England keeps India backward, because the money cannot yet be found for magnificent extravagance. Let our Engineers (who are many of them really first-rate men,) then at once throw the fancy to the winds, and if they cannot construct magnificent works, let them be original, and shew how much real and serviceable work they can give us for the minimum of cost; and our children can ornament their works at leisure with the wealth which those works will by that time have brought them. Rome was not built in a day, it was only mud huts in the time of Numa, nor was it marble till the time of Augustus; neither can India at once overtake England, as some of our engineers vainly strive to do, and fail lamentably in the attempt: for chunam, however finely polished, cannot be mistaken for marble.

No! let us have the practical and the useful first, and the grand, ornamental, and magnificent will follow in good time.

Apropos to the above are the remarks of David Stevenson, F. R. S. E., &c., in his "Sketches of the Civil Engineering of North America." I quote them because I think an adherence to the principle laid down would cover India with canals and other public works in one-tenth of the time of our present rate of progress: and thus furnish means for improving the works from their own earnings. In his Chapter IV on canals he says—

"English and American Engineers are guided by the "same principles in designing their works; but the differ-"ent nature of the material employed in their construc-"tion, and the climates and circumstances of the two "countries naturally produce a considerable dissimilarity, "in the practice of Civil Engineers in England and in "America. At the first view, one is struck with the tem-"porary and apparently unfinished state of many of the "American works, and is very apt before inquiring into "the subject, to impute to want of ability, what turns out "on investigation to be, a judicious arrangement to meet "the circumstances of a new country."

Again, "It is vain to look to the American works for the "finish that characterises those of France, or the stability "for which those of Britain are famed. Undressed slopes of "cuttings and embankments, roughly built rubble arches, "stone parapet walls coped with timber, and canal locks "wholly constructed of that material, everywhere offend "the eye accustomed to view European workmanship. But "it must not be supposed that this arises from the want of "knowledge of the principles of Engineering, or of skill "to do them justice in the execution."

"The Americans have been in many cases induced to use "the material of the country, ill adapted though it be in

"some respects to the purposes to which it is to be ap-"plied, *in order to meet the wants of a rising community,* "*by speedily, and perhaps superficially, completing a work* "*of importance, which would otherwise be delayed from a* "*want of means to execute it in a more substantial manner*" —the Italics are mine—"and although the works are want-"ing in finish and even solidity, they do not fail for many "years to serve the purpose for which they were con-"structed as efficiently as works of a more lasting descrip-"tion."

"When the wooden locks* in any of the locks begin to "shew symptoms of decay, stone structures can be substi-"tuted, and materials suitable for their erection, are, with "care and expedition, conveyed from the part of the coun-"try where they are most abundant, by means of the canal "itself to which they are to be applied, and *thus the less* "*substantial work, ultimately becomes the means of facili-*"*tating its own improvement, by affording a more easy, cheap,* "*and speedy transport, of those durable and expensive ma-*"*terials, without the use of which perfection is unattainable.*" The Italics are mine.

He also advises local material to be used for another reason, improvement and enlargement is more easy, "*and with-*"*out the mortification of destroying expensive and substantial* "*works of masonry.*"

All is this encouraging, as shewing what may be done with small means, when the will to effect improvement is not wanting.

* I would not be understood to advocate wooden locks in India for our canals, as wood in this country would be much dearer than cut stone would be. I merely advocate the principle of using such material as is at hand, and locally available, whatever that may be, in preference to sending to England, or to a distance, (which would cause delay and expence,) both of which can ill be afforded; and if this had always been done, the Goolsukkre, Botanneh, Moorir, and other bridges on the Grand Trunk Road, would years ago have been in active use.

The above may appear a digression, but is not in reality so, as from the immense extent of India requiring improvement, its immense latent resources—latent only because of the comparatively small funds available to develope them,—every suggestion which can point out a way of temporarily extending those means tenfold for the present, will enrich the country and the government by the difference of time, the saving of interest, and the amount of resources developed by those means.

We will now take a slight glance as to how far irrigation benefits the people.

In Behar there are but two tribes of people, who use irrigation from wells in system, the Quiries and the Koormies, the process of well irrigation being too tedious, and expensive for the other people, they being too indolent to use it as these tribes do, and their fathers and grandfathers never having done so before them. Yet well irrigation pays these Quiries and Koormies tenfold. They are the men who grow opium for Government, and theirs are the luxuriant crops which surround every village but a short distance from its huts, and show what an Indian soil is capable of producing. They are the producers of cotton, tobacco, spices, turmeric, anise seed, sesamum, castor plant, potatoes, and other vegetables, and have brought their small holdings in general to so high a state of cultivation, that the zemindars, with the selfish policy of Asiatics, always charge them fourfold the quit-rent per beegah paid by other classes. Yet these men are comfortable and well-clad: and, unlike other cultivators of the soil, always pay their rental in money, not in kind. A few families of Quiries, after them of Koormies, are eagerly sought for in the villages: and the Zemindar who has them considers his proceeds as certain. Other lands in the village which pay a money rent may let from four annas to one rupee per beegah: the Quiries pay from Rs. 5 to Rs. 15 per beegah: and then make a handsome

profit; they irrigate well, and cultivate their land like a garden; and have a constant succession of crops from their lands. In a Quirie's field you will find no clods: neither any weeds: the earth is dug deep and well broken up; nothing larger than a walnut to be seen: they manure their fields and they fence them: and care but little for the season: dry or rainy; of the two, they perhaps prefer a season moderately dry; because of rain they may have too much: while when they irrigate, they can regulate their own supply.

I find on inquiry that a Quiry with one pair of bullocks, can, in the hot weather, irrigate one-tenth of a beegah per day; and in the cold weather one-seventh of a beegah, a beegah is about two-thirds of an English acre;—this—allowing four annas per diem, a low rate of hire for two labourers;—pair of bullocks;—wear and tear of rope and bucket, &c.,) would leave each irrigation to cost in the hot weather Rs. 2-8-0 per beegah: and in the cold weather Rs. 1-12-0 per beegah, for each: water canals could afford irrigation at one-tenth of this price, but should be charged for according to the number of waters required for each crop. For instance sugar-cane. It is sown in Shahabad in March and April. The ground is irrigated before sowing and ploughing, therefore a good shower in March increases the cultivation of sugar-cane tenfold. Fifteen days after its being sown, or rather planted, it is again irrigated, and dug after irrigation, by hand labour, or oftener, to keep down the weeds. It is usually irrigated four or five times before the rains, but not after them.

The poppy is during its growth irrigated, (and sometimes weeded and dug) every 10 or 15 days for five months.

Native cotton is sown in October, and is irrigated twelve to fifteen times from January to May, and dug and weeded three or four times. How much labour would irrigation from canals save these people, and if irrigation could be had at will, they

could at least cultivate ten times the amount of land they now do in these staples.

Potatoes in the field are watered four times, sometimes five. Allowing each water to cost only Rs. 1-8-0 per beegah, there is still at the lowest calculation Rs. 6-0-0 per beegah expended for irrigation alone, and this at their own nominal valuation for labour, employing their own families, and their own cattle. No European cultivators or none but those who work in the field all day themselves, could irrigate with rope and *mote** from the well at even these prices, yet, if the cultivation of cotton, sugar-cane, opium, safflower, anise seed, tobacco, vegetables, and other similar staples, pay the labourer with these prices, what benefits might not the country expect from a judicious and cheap system of canal irrigation, while the canals would also afford cheap carriage to the nearest mart for the surplus crop.

Canals pay well in the Punjab, although there is as yet no sufficient market for the surplus crops of grain and oil seeds yielded through their aid, but how long will that state of things continue; abundance breeds new wants, and commands fresh outlets. In Behar it could not however occur for a day, as Behar has markets for all she can possibly produce in Benares, Mirzapore, Chowsah, Ghazeepore, Patna and other marts of commerce, and could dispose with ease of her crops, even if they should be increased an hundredfold, and be another link of strength to the British rule.

Indigo if sown in what is called *Jamowah,* is sown in April and May: the ground irrigated before ploughing and sowing, again irrigated after germination, and then two or three times afterwards before the rains; but this is never done by the planters themselves, but is given by contract to Quiries and Koormies to sow after their opium

* A large leathern well bucket, holding about 10 gallons.

crops are gathered, seed to be found, and land rent to be paid by the planter; yet this cultivation pays the planter much better than rain cultivation would do, as being a more certain crop, and enabling him to get two cuttings before October, when he can only get one from a rain cultivation, and that by no means a certain one, as too little rain causes the young plant to dry up, and too much rain rots it, it is only in the happy medium which can be obtained alone by artificial irrigation that there is certain success.

An irrigated crop of Indigo besides does not deteriorate the land so much as the present rain crop does. I speak of the central Indigo destricts of Behar and Benares, as in Tirhoot and Bengal, the times for sowing are different; and the *modus operandi* of cultivation not the same. The rain crop being sown in June and July, affords, as has been said before, but one cutting the same year, and that in October, and keeps the land occupied by the roots of the plant during the succeeding hot weather, so that the planter may obtain his second cutting in July and August of the season succeeding the planting, thus being a fertile propagator of weeds: whereas if the two crops could be had in succession during the rains as they can by irrigation, the land could be again ploughed in October, that is after six months' occupation with Indigo, and a crop of vegetables, opium, grain, or other cereals, obtained in the four following months, and this not only with manifest improvement to the land, through being more frequently opened by the plough, and its consequent extra absorption of the caloric and oxygen of the atmosphere: but actually doubling the yielding powers of the land for one crop: and giving a second crop as a *bonne bouche* for the farmer; while, as everything which enriches a province must also enrich Government, the Government in the end would be the gainer.

It may be asked if this is the case, why artificial irrigation is not more resorted to? The answer is obvious. With the deep well (from 20 to 60 feet deep) leathern bucket, pair of bullocks and rope, artificial irrigation is too slow an operation, and limited only to the classes who habitually use it; besides wells are by no means abundant; while with the dishonesty of the native, artificial irrigation, by paid labour, or by any other terms than the contract system, will never pay, as the labourers steal their time by idleness, neglect their masters' cattle, and speedily ruin them—neglect his well-ropes and buckets, rendering constant renewal imperative, and do not water half the land, or do it half so well as if watering for themselves, while native superintendence in most cases only aggravates the evil, as bringing another daylight robber to take another handful from the work for his own benefit.

Canals and irrigation however would remedy in a great measure this evil, as the labourer would have nothing to do but to distribute the water: and then crops of cotton tobacco, oil seeds, spices and other staple crops, which England calls for, would speedily cover the face of the land, and render Great Britain independent of other countries for her great staples of commerce.

Had we canal irrigation, such a picture of the state of affairs at Baughulpore as the following, extracted from the columns of the "North-West Gazette," of the 27th March, 1860, would be impossible. The writer says—"We are much "distressed for rain—not having had a fall (excepting a few "drops in January) since October last. The spring indigo "sowings are consequently very backward, and the October "crop has been damaged very seriously already by the "west wind.

"Indeed vegetation in every form and shape (excepting "sugar-cane, *which is only kept alive by constant irrigation,)* "is suffering from dearth of moisture. The oil-seed crops,

"of which the toree* was gathered a month ago, and the "linseed which is only being taken up now, promised very "well at the outset; and had there been any rain in "January would have certainly yielded a rich harvest, they "will now barely cover the expense of cultivation?

"In the same way, the wheat, barley and oat crops, of "which there had been great expectations, have turned out "miserable failures:—the oats especially have suffered."

We will now turn to the report of Lieut. Keatinge, Assistant to the Superintendent in Nimar, dated 17th March, 1848, regarding works constructed for the purposes of irrigation near Mundlaisur, he says:—

"During the dry months the volume of water at the site "of my dam, nearly opposite the village Kitcha, is almost "120 feet (cubic, I suppose,) per second, this would suffice "to irrigate 30,000 beegahs of land, under even tolerable "management, and flowing as the river does through a "rice growing country, its agricultural prosperity entirely "dependent on artificial irrigation, the Zemindars in the "neighbourhood naturally took no small interest in the "success of my project, and willingly entered into agree- "ments to pay their portion of the expenses, rateably to "the quantity of land irrigated."

Again he says—

"I may cite as an example, the village of Amdandah in "Chowmillah—the first in the line of irrigation. It is as- "sessed at Rs. 1,500, and has for some years been a heavy loss "to the proprietor, a Zemindar possessing very large "estates. The number of ploughs in it in December, 1845, "were 40; by May, 1846, the number of ploughs had in- "creased to 110, and during the past year, the village "yielded a handsome surplus, after having paid its revenues. "Many of the villages of Chowmillah were in a similar

* Mustard seed.

"condition with Amdandah; *indeed, there were few with* "*which their owners would not have been glad to part with,* "*previous to the canal being opened.* That a considerable "change in the value of land has taken place may be "supposed from the facts, that an agent of Nawaub "Mallick Khan of Rampore, was last cold season sent to "Chowmillah, with orders to purchase villages to the "amount of a lack of rupees, *but could find no one willing to* "*sell.*"

This shews that a wonderful change had been effected over the face of the district by irrigation; and *that* irrigation only on a small scale:—the value of land had been much more than doubled in one year to the proprietors without loss to government, and shews what may be effected for most parts of India: if the government are only willing to try. Lieut. Keatinge is so interesting however, and his data so much to the point, that I must quote him again:—

"In the Saharunpore district, the excess of produce of "wheat, on irrigated, over unirrigated land, is 554 lbs. per "acre:—the value of which at 60 lbs.* per rupee is more than "Rs. 9. I have no exact data in Rohilkund, but allowing "the proportion to be somewhat similar, a water rate of 5 "annas per acre seems inordinately low.† In rice land the "advantages of irrigation are even more valuable, the aver- "age produce per imperial acre is 1875 lbs. while last year, "owing to the very abundant rain, equivalent to as much "water as required, the produce was on an average in the "Rohilkund Terai no less than 3,125 lbs. per acre. In "some instances, where the soil was extraordinarily good:—

* In Shahabad wheat has sold during the past two years under 36 lbs. per rupee, so that the difference here would be much greater.

† I should think it is. The Madras government in some instances charge Rs. 5/, and I can answer that Rs. 1-8-0 per acre would be willingly paid in Behar—and no grumblers.

*and water always available** the produce has been so high "as 4625 lbs. per acre (the average produce in Rohilkund "per acre in ordinary years, out of the Terai, may be esti- "mated at 1250 lbs.—the highest 1875 lbs.) the result of "which ample crop was that I myself met cattle laden with "rice† returning from the Philleebheet market, the owners "not having sold their grain, because they could not find "purchasers but at 120 lbs. per rupee. Were I called upon "to fix an arbitrary rate—(for arbitrary it must be,) I "should say let it be 10 annas per acre, *not that this is the "actual value of the water, or nearly so,* but by fixing that "rate I should be dealing tenderly with the zemindars, and "I should secure a sufficient return on the works, I have at "present on hand, to pay ten per cent on the government "outlay;—to defray the cost of collection;—and annual "repairs,—to cover the amount of my own salary; and what- "ever surplus remained, should be credited to the zemin- "dars, either in remissions, or in building bridges and corn- "mills, or making other improvements connected with the "canal for their sole benefit."

I do not agree with Lieut. Keatinge however that with such ridiculously low rates there should be any remission, even if there is a large margin of profit. If the government sell the water at a low rate, they will have done their duty, and any thing beyond the actual interest in the outlay, and the current expenses, should be credited to the Imperial revenues, as a fair and legitimate mode of increasing them.

* Yes; that is truly the grand secret of growing rice: and more than these averages are obtained in *some* of the villages of Shahabad, which are favoured with an abundant and unfailing supply of that grand rice grower and Indian cultivator's desideratum.

† Or was it *dhan*, that is the rice before it is husked: which is the only way in which it is taken by the cultivators to market? When it is husked, they only sell it from their own houses, as they want money for their weddings, or other ceremonies, involving expense.

He also says "The corn mill constructed near Nuggee-"nah *has paid* twenty per cent. upon its cost."

It would appear that the water rent charged was ridiculously low; and if with those low rates such results are obtainable, what large advantages would not the government gain by a more fair equivalent being taken from the zemindars for the enhanced value given to their estates. I am aware that much higher rates than Lieut. Keatinge's are charged on the Ganges and Baree Dooab canals: but the expensive system—I may say the grand system of construction of the former,—at least necessitated such extra charges. Lieut. Keatinge's data are however valuable as shewing *what can be done* if old engineering traditions can be thrown aside. In the same report again we find him saying:—

"The volume of water flowing in the canal 120 feet per "second, would, according to Major Cautley's data, suffice "for the irrigation of 42,000 beegahs of land. Supposing it "however to happen that on an average number of years, "only one half that quantity, or 21,000 beegahs, were "watered, then by charging three annas per pucka beegah,— "the sum claimed whenever rent *is* charged in Rohilkund— "I should clear close upon 4,000 Rs., and allowing Rs. 1500 "to go to the interest account, I should have Rs. 2,500 left "for annual repairs and cost of collections."

At three annas a beegah for irrigation, Rohilkund ought to be an Indian paradise,—yet according to Lieut. Keatinge's account, even that ridiculously low charge, leaves a handsome profit to government, after paying interest on outlay and all working expenses. What fact can shew more completely that irrigation is a paying speculation to the government, and almost the only tax which can be realized alike to the profit of the people and government? Even if the government borrowed money at six per cent. for the purpose, in a few years they would be clear of their debt, and with

an enhanced revenue: while the country at large, and their own exchequer call loudly for the outlay.

In Lieut. Keatinge's canal, if Rs. 1 per pucka beegah had been charged; and only 21,000 beegahs irrigated, not only would the original expenditure Rs. 15,000, as stated by Lieut. Keatinge have been paid in one season, but Rs. 6,000 would have been spared over and above the cost, to defray repairs, costs of collection &c. on the first season's outlay. All canals would not pay like this, but many would;—and many might be constructed, where the facilities are great which would pay even better. I could point out localities in Shahabad which would pay better still: and I feel certain that in no part of India, where canals are really required, if proper economy be only consulted in their construction, can they possibly be failures in a financial point of view.

It is, I believe, an erroneous opinion, yet one which obtains largely, that irrigation from canals, is only required during the dry season for the Rubbee crops, which consist principally of wheat, oats, barley, gram, lentil, and dhalls of different kinds, oil seeds, and many other field crops, but this is an error which cannot be too soon dissipated. As a matter of course, irrigation would be much more general for the rubbee crops, and would enable the cultivators to grow more extensively, in fact to a practically unlimited extent, the important staples of sugar-cane, cotton, in all its varieties—hemp, jute, indigo, safflower, and numberless other valuable products which are now sparingly produced, and that only in the small quantities of land immediately surrounding villages and wells.

Not only would this effect be produced, but the breeds of cattle, (and that in real farming is a great desideratum,) would also be improved, and the farmers encouraged to pay more attention to crossing the breeds with approved stock, by the facility which irrigation would offer for the production of gram, which is at present an impossibility. Stock

farming is at present unknown, but there is no reason why the horned cattle of Shahabad and Behar, should not become as fine specimens of the bovine race, as those of Hansi,* and Guzzeerat, provided they can have succulent fodder, which cannot now be obtained, owing to the little green visible upon these arid plains for five or six months of the year, forcing the cattle to obtain a precarious subsistence, by eating such stalks, thistles, leaves, and other rubbish, as they may be able to pick up, in addition to the small quantity of *boosah*† their owners can afford to give them.‡

Sheep too,—who has not felt his visible faculties strongly excited by seeing the little abortions, which in this country bear that name, and the wiry looking blankets, which are woven from their so called wool, which the commissariat department of India, with its accustomed liberality, foist upon our European soldiers as a substitute, and an equivalent for the flossy blankets of home:—and who—when forced to eat the flesh of grass-fed sheep—has not looked with astonishment at a so-called quarter of mutton, which when laid on the table does not weigh four pounds?

This question of mutton, or I am in error, will be forced upon the attention of Government and settlers in an

* These were raised to their present comparatively high standard, by the exertions of one man—the late Colonel Skinner, C. B., whose farms and dairies shewed what may be effected in India, by will, energy, and wealth combined: and although perhaps his improvements were not very profitable to their public-spirited proprietor at first, have yet conferred a lasting benefit on the province, and Hansi cows are in demand where good milkers are required; but even Col. Skinner could not have effected what he did for Hansi, but for Feroze Shah's canal which waters that province.

† Straw ground to small pieces by the action of the hoofs of the cattle in treading out the grain mixed with the chaff.

‡ The Aheers, or Gwallahs, tribes of herdsmen who keep Buffaloes for milking purposes, often give their cattle coarse oil cake with *boosah* and horse-dung mixed, the latter they consider very good for the cattle: as there is a large quantity of half-digested food and grain comes from the stomach of a well fed horse.

unpleasant manner soon. The number of European troops, Sikh, Pathan and Punjab levies and regiments, and the influx of employés and settlers from Europe, are gradually but surely extirpating the breed of sheep, by the increased consumption which they have caused: and this cause of extirpation is daily increasing. Sheep have doubled in price during the past three years, and the commissariat cannot get their supplies, without the aid of the police. In fact sheep are scarcely obtainable in any quantities at any price; and yet there is no climatic reason why sheep should not be as large, as plentiful, and furnish mutton and wool, of as good a quality as Australia, except the want of herbage, which want would be remedied by irrigation:—as witness the superiority of the sheep of Peshawur, Cashmere, and Cabul.

Thousands upon thousands of acres of tolerably level land, in the Kymore range of the Vindhya Hills in the Zillahs of Shahabad and Mirzapore, would form admirable sheep pasturages, and sheep runs for nine months of the year, leaving the sheep farmers to bring down their flocks to the plains for the months of April, May and June, after the rubbee crops had been harvested, when the rich succulent herbage which would spring up after the grain crops had been reaped, in consequence of the moistness of the soil resulting from recent irrigation, would furnish the flock with abundance of food:—and crops of cabbage, kale, clover, turnips, lucerne, and the sweet grasses of India, of which there are several, would,—being possibilities, entirely obviate the necessity and expence of fattening the sheep by what is called *gram* feeding:*—while there is no reason why the table lands of the Kymore range (when public attention is directed and awake to the subject) should not be the home,—the acclimated

* That is, by giving each sheep a portion of that pulse daily to fatten it,—an expensive process.

home, of the *Llama*, the Vicuna, and the Alpacca, and thus add another to the vast resources of British India.

I have already said that it is an error to suppose that irrigation would not be required during the rains. I know that in Shahabad, Behar, Ghazeepore, and Benares, it would be as eagerly, or perhaps more eagerly sought for during the rains than at other times; as it would render the rice harvest a certainty, which in the great majority of seasons is not the case at present, and Lieut. Keatinge has shewn that this is also the case in Rohilkhund. That this is the case here is shewn by the immense fluctuations in price which have taken place during the past six years. One year 100 lbs. per rupee were sold, and last year from 14 to 24 lbs. only.

This enormous fluctuation in the price of a standard commodity in universal use could never occur if the rains could be depended upon for irrigation of the crops as required. The zemindars do what they can by the erection of local *bunds* in different portions of their estates, and thus form behind the bunds a large stagnant tank or morass, to regulate the supply to the demand in a primitive and expensive fashion: but the remedy when they have not the control of a running stream emptying itself into the *tál*,* or regular supplies from the clouds, is but of limited value, for as all these *tâls*, or reservoirs, must be superficial, to allow them to run off the water into the *dhân*† fields as required, they can be but of moderate depth, not more than 1½ to 2½ feet, and that spread over a large surface. When fifteen, twenty, or even thirty days of drought occurs, which is often the case in the months of August and September, the evaporation from so large a surface, the absorption of its bed, and the filtration from its banks, dries up the tâl, and with that the hopes of the cultivator; and I have

* The local name for the surface reservoirs.

† Rice is called dhân till it is cut and husked, when it is called *chowul*.

often known thousands of acres of rice cultivation, almost in the ear, and which had a most promising appearance, suddenly withered, and rendered useless for want of a due supply of water at the time of the formation of the grain; and in these cases, so completely destroyed are the prospects of the crop, that the cattle are turned into the fields to graze them down for the sake of the straw alone; there being no grain to reap, not even the seed grain expended, being recovered.

The extent of misery caused to the poorer people by the failure of this their principal staple of food is frightful to behold, and so late as 1859 only, was so great, that numbers of villages in Shahabad at the foot of the hills, were half or two-thirds depopulated, while emigration to the Mauritius, and other colonies, of troops of coolies, occurred to such an extent that a repetition of the like would be almost ruin to the district. We have not a cooly to spare;—they are far too few at present. We could spare troops of Brahmins, Rajpoots, and Kyasths—who are too proud to work, too dignified to dig or plough, but not too honest or proud to beg, steal, or rebel—much better than we can spare a few hundred coolies, the emigration of each one of which is Rs. 50 per annum at least extracted from the producing powers, and therefore from the vital wealth of the district.

Taking the value as correct, and it is said that 30,000 coolies emigrated to the colonies from Shahabad alone in 1858-59 official year, we have a sum total of fifteen lakhs of rupees (one hundred and fifty thousand pounds,) per annum dead loss to the agricultural resources of Shahabad by this emigration alone.

How important then is it, looking at the question in a humanitarian, in a financial, in a patriotic, in a politic, or in an economic point of view, to render this wholesale emigration impossible, by attending to the wants, the pressing wants of these districts in the matter of irrigation: for,

after all, it is to the peasantry of India, whom the Anglo-Saxon, with his organization, his energy, and his skill, must look to enable him to develope the multifarious resources of Hindostan. To parody the words of a late noble poet we may say,

> Let Brahman, Patan, and the Rajpoot fly,
> But leave to us our Indian peasantry.

In Shahabad and Behar, Benares, Ghazeepore and Mirzapore, in addition to the tâls provided in almost every village by the zemindar, to ensure for them for their rice crops as much water as they can obtain, or, to speak more correctly, as much as they can possibly store, every nullah and small water-course from the hills is brought into use for irrigation purposes, and dams of large size are constructed, and irrigation channels sometimes of several miles in length are cut, for the purpose of conducting the water thus obtained to other village reservoirs; but this is all done in an irregular manner, and very much in accordance with the good old maxim,

> That he shall take, who has the power—
> And he shall keep who can.

Serious affrays for right of water are of constant occurrence: and at least half the cases brought before the magistrates under the provisions of Act IV of 1840 are for water right. Dams are often surreptitiously cut, (which occurring as it always does, when water is the most urgently required) is productive of great loss: while litigation—which inflicts a greater loss still—of a protracted and unsatisfactory character, is the almost invariable result. There cannot be a doubt but that our officers, Judges, Magistrates and Collectors, strive to do justice in these cases, but under our artificial system with its multiplicity of appeals, and consequent irregularity of decision, it is almost impossible for them to succeed;—and therefore in a water dispute the longest purse almost invariably carries the day.

Our officers as a rule, surrounded as they are from their first entrance into this country until their retirement or their death, by a class of sycophants and rascals who could only exist in the atmosphere of our courts, and whose very bread consists in the Hakim being kept in ignorance of facts patent to everybody else, residing also as these officers always do in Sudder stations, apart from the agricultural classes and apart from the European outsiders or interlopers (call them what you will): and even when on their tours, and sincerely desirous of obtaining information from the people of the country, they yet can learn nothing (such is the sycophancy of the native mind) but such facts as the party questioned knows will please the questioner, which natives are astute enough to find out from the nature of the question put. The officer must therefore be a phenomenon, surrounded by all these difficulties, who knows much of the local usage, of the people, and he can know less of the agricultural capabilities and customs of the country; a further obstacle is placed in his way, by the constant removal from district to district which he has to undergo, so that no sooner does he know any thing of Behar than he is transferred to Assam or to Hooghly districts differing as much in local usages, customs, and language as one nation in Europe from another, so that fresh inquiry only disgusts him. Can we wonder then that, as a natural consequence, the decisions given in five cases out of ten, in water and boundary disputes, are erroneous in principle, and crude as to fact, however consistent they may be in law.

I can mention one instance. A hill stream rises in the lands of a large proprieter in Pergunnah Chynepore; this stream in fact runs for upwards of two and a half miles from its source through his estates, the principal valley of which it thoroughly drains, yet he cannot use the water, which is all claimed by another village four miles down

from the head of the stream, and 1½ miles from his estates; and which village has grown rich, populous, and powerful by the use of the water of this stream—; and, strange to say, a Sudder decree was obtained by the village in question, which prevents any one taking the water but themselves, though common sense would say, that if any one *had a right* to the waters at all, it would be the party in whose estate the stream has its rise and course, and whose drainage it collects. It passes through several other villages before reaching the bund, and its bed is included in the Government revenue maps as a portion of the ground on which land rent is paid for all those villages; yet all this water is allowed only to enrich one village when it ought to enrich twenty.

The name of the stream is the *Parei;* it takes its rise in the Ramgurh valley Chynepore, Shahabad, in the estate of Baboo Benipersad Sing, passes through four of his villages, and finally delivers its water into the reservoirs of *Mokree*, to which village it is worth a clear annual revenue of eight thousand Rupees. Through its fertilizing effect the lowest ryots of Mokree are raised above the state of coolies; and, in comparison with other villages around, all its inhabitants are well to do, and many of them wealthy, a convincing proof, if such were wanting, of the value of irrigation. After passing the Mokree bunds, its spare waters are used in other villages, but seven-tenths of the water is used by Mokree alone.

This will appear more strange, when it is stated, that on the Ramghur estate, and across the Ramghur valley; there are yet the remains of a very extensive *pucka bund*, which tells its origin by the name of RAJBUND, and which bund was originally about three quarters of a mile in length, damming up the waters of this stream; and from which dam irrigation ducts were thrown out as feeders to all the villages around, when tradition says *all* the villages were

prosperous:—but then all these villages belonged to one tribe, acknowledging one head, now they are subdivided amongst hundreds of shareholders, and

Those have kept who *could.*

The remains of a very fine pucka bund is also to be seen, which formerly spanned the narrow gorge of the *Tarra chandnee** pass, through which the *Koodra* river debouches into the plains of Sasseeram, and which, when in its integrity, must have formed a large and valuable lake behind it; but this dam has evidently been cut away forcibly as the marks of the tools used in destroying it are still visible in its indurated masonry.

This bund must (if the canal system be introduced into Shahabad) be re-erected, or a lock formed here, as a most valuable reservoir would thus be furnished at a trifling expence indeed.

Another large earthen bund has been constructed by Shah Kubeer-ood-deen Ahmed, of Sasseeram, across a gorge of the hills in his estate of *Daondhar* on the Sasseeram and Tilowthoo road, but I am inclined to believe that there was a large bund there before it passed into Mussulman hands, by the fact of the remains of a Hindoo temple being found in one part of it.

A fine bund also spans a narrow gorge of the valley now called *Betree ka Bund,*† and which if kept in repair would dam up the waters of the valley, forming a lake of some four superficial miles in extent, with a rocky barrier all round, and taking as it does the waters of a branch of Doorgowtee River, or if need be of the whole stream, the supply would be certain; but, owing to local jealousies and quarrels, the bund is not maintained. It was restored and

* It is possible this bund (and a small mosque above it) may have been built by Shere Shah, to supply his palace (about 2 miles off at Sasseeram,) with water, as necessity is the mother of invention.

† Inside the Bund.

re-erected by an enterprising planter named Joseph Bruce, an East Indian, but the name of the valley shows that it was bunded long before his time, probably by the Cheeroos, who were formerly a powerful tribe, at the foot of the hills in Sasseram and Palamow.*

The same gentleman who re-erected this pucka bund, also created a pucka bund across the Sooreh river at Massaye, which however since passing out of his hands, and in consequence of local jealousies, has not been kept in repair.

Wherever Zemindars have large and compact estates, and with streams or small rivers running through them, we always find them taking advantage of the circumstance to erect *bunds* and dig irrigation ducts (locally in Behar called *bahahs*). These are of course extremely profitable to them, but are in fact acts of oppression to smaller proprietors; as these bund owners have,—partly though custom, partly by force, and partly through apathy on the part of government,—come gradually to assume a total ownership in the streams in question from their source, or from some other powerful proprietor's bund, to their own estates: and prevent either by force or bribery, or by that legal chicane (which is so easily practised in our courts, from the fact of our officers knowing so little locally of their district, and their omlah knowing a great deal too much,) the small proprietors from using the water which passes through their villages: or, if their high mightinesses allow them to do so, it is only after receiving from them a bonus, or black mail, as quit-rent for the use of the water.

The estate of *Bure*, forming part of talooka Manpore, in Chynepore, is a case in point. It is now in the possession of Dewan Futteh Hossain Khan and others:—very worthy men, particularly the former, who received from government

* And now form the principal part of the inhabitants of the Kymore Range in Shahabad.

a very handsome gold watch and chain with suitable inscription for his loyalty: and the assistance he rendered me in preserving order during the rebellion. This estate commences on the Quoirah river, about two and a half miles from the place where that stream debouches from the hills into the plains of Chynepore: but the maliks of Bure claim the full right in the waters of that stream; and sanguinary are the contests which have taken place, when other individuals higher up stream have endeavoured to utilize for themselves, by damming up any portion of its waters.

These sanguinary affrays of course never reached our courts any more than the bloody quarrels of Highland clans came under the direct cognizance of his Majesty's justiciary in Scotland one hundred and twenty years ago. Lives have been taken; but the right of water has been preserved at any risk:—and who can blame the proprietors, when it is known that the right of water to that estate alone is worth at last twenty-five thousand rupees per annum. The estate pays a government malgoozarree of about seven thousand rupees per annum; and its produce, even in a bad year, is never less than Fifty thousand Rupees, as the malik's share, besides the profit of his subordinate leaseholders and cultivators. Four bunds are kept in constant repair on the Quoirah near Bure:—aye?—and in the season these bunds are well guarded too, and at least ten miles of irrigation channels or *bahahs* branch from them in all directions. Some other villages have also a recognized right to take water; and water channels of some miles in length are kept in repair by them.

Again, the Kookoornaye river, in Pergunnah Chynepore, passes through two large estates belonging to a tribe of *Koormies*, called *Chowdries* in local parlance, and the Kookoornaye is in consequence dammed largely in their estates. They sell the spare waters to poorer landholders, but on no account allow them to take as their own the

streams which run through their own villages. One bund, that of *Siktee*, brings in these Chowdries a clear revenue of at least 700 Rs. per annum, after fertilizing their own estates. The consequence therefore is that they are rich men, and, although of the lowcaste of Koormies (Sudras), are called, and arrogate to themselves, the title "SING."

These instances of the value which the native farmers attach to irrigation, and the avidity with which they avail themselves of the means, their wealth, power, influence, or right, gives them over running streams from the hills, for the purposes of fertilization, might be multiplied a hundredfold from my own knowledge;—but these will suffice as illustrations, sufficient for this necessarily short paper. I must however mention that in the table lands of the Kymore Range, which have not for the past ten years, if ever, been visited by any of the authorities—and which are inhabited only thinly by aboriginal tribes of Kyrwars, Checroos, Koles and Bhurs—the right of possession in the various streams before they precipitate themselves into the plains is often fiercely contested, and there is not one of these streams, which is not dammed in more than one place in every village through which it passes, and made to pay its tribute to Hill cultivation;—the result of which is, that the finest rice in Behar is produced in the hill lands of Shahabad, and more particularly the varieties of musk rice:—called by the natives *Sookdass* and *Sham-jeerah;* which, from its strong smell of musk, when boiled, is so much prized by native epicures, and which really has a fine flavour; but its strong musk smell, when on the table, must ever render it rather offensive to European olofactories. reminding them, as it does, of that abominable little ruminant, the musk-rat or *choochoondur*, which infests so many houses; and which I have heard people gravely assert can even impart its peculiar smell and flavour to beer, by running over corked bottles of that liquid.

It may be, and has been argued, that the native landholders have the same right in the stream that they have in any other portion of their estates; and that if a native Talookdar has erected a bund for years:—his right to do so, and to prevent others from doing so is incontestable. But this argument cannot hold good except on the principle of the distich quoted before, "Might over right." It would be as well to argue that the pirates of the Riff have the *right* to plunder and piracy on the Mediterranean, *because* they have exercised the power of doing so from time immemorial: as it is notorious that these bunds are only erected across running streams, by courtesy called rivers, by those who are powerful enough to ride roughshod over all opposition: and are consequently in general gross acts of oppression towards neighbouring proprietors. If it be allowed or conceded that these men have the right to dam up waters passing though their estates, there can be no objection to the practice, *provided it does not interfere with the navigation, or the communications of the country*, and I cannot see how it can avoid one or the other, unless every dam proprietor be made to build bridges or locks wherever that navigation or those communications require:—but if the right be conceded to one, it must with evenhanded justice be conceded to all; not limited as at present to the rich proprietor.

I am of opinion however that the concession of any *rights* over running streams to individuals is an error in India, as certain to lead to oppression and litigation, and besides depriving the state of one of its imperial rights: which will eventually bring it a noble revenue, and a constantly increasing one. So impressed am I with this fact, that on the occasion of a roobookaree* from the Collector of Shahabad, dated 10th September, 1858: written in accordance with a letter from the Sudder Board of Revenue,

* An Official court document in the vernacular.

No. 300 of the 23rd August, 1858, to the address of the Commissioner of Patna, and in accordance with Government circular of the 24th June, 1857, respecting the possibility and propriety of bunding rivers and water-courses for irrigation purposes by individual proprietors:—which papers were quoted by Shah Kubeerooddeen Ahmed, Hony. Assistant-Magistrate and Deputy-Collector of Sasseeram, in a roobookaree to me, asking my opinion on the subject, that after replying to his roobookaree, I considered it my duty to state my opinions on the subject to the Commissioner of Patna, E. A. Samuells, Esq., in a letter dated 4th October, 1858: and as from further consideration of the subject, I am only more confirmed in my opinion; I will quote some paragraphs which are apropos to the present subject:—

"*Para.* 2.—The subject in question is one of so much importance, and involves so many interests, that I think it my duty, both as a landholder, farmer, and magistrate, to state what appears to me, to be a fair and honest view of the question, both as regards the people and the Government, and cannot help thinking that the roobookaree has been called forth by a one-sided view of the question being placed before the Government."

"*Para.* 3.—There cannot be a doubt but that the bunding of rivers, particularly the mountain streams of Behar, at various points;—more particularly at places where they debouch into the plains, would, if properly carried out on a systematised plan, prove of incalculable benefit, and by the storing (if I may use the expression,) of the surplus drainage of the Kymore hills during the rains, render the whole, or at least the greater portion of Shahabad, a perfect garden, and this at no extravagant cost. I speak more particularly of Shahabad, because of my intimate acquaintance with nearly the whole of the district, and with the whole of the mountain streams which fall into the plains, from the northern and eastern faces of these hills. I have

been interested in this subject for several years, and have given it a great deal of my attention. I had the honor to personally state my opinion on the matter of Irrigation canals to His Honor Mr. Halliday, Lieut-Governor of Bengal, in the year 1854, when His Honor visited this district, and Mr. A. A. Swinton, the Collector, and myself, had several conversations and some correspondence on the subject.

* * * * * * *

Shortly after my interview with the Lieut.-Governor, Captain C. H. Dickens, of the Artillery, (who had also it would appear given his attention to the subject,* and had, (having peculiar opportunities of doing so,) pressed the matter on the observation of the authorities, arrived in Shahabad, and commenced a survey in connection with *his* canal project. His plans embraced both Shahabad and Behar, and the bunding of the mountain streams was I believe only a subsidiary part of his great plan. These surveys were interrupted by the rebellion, which may perhaps for some years delay the execution of Captain Dickens' plans in their integrity; as the amount to be expended would necessarily be large, and funds for the purpose may not for some time be forthcoming. Captain Dickens' plans embraced, I believe, more than one navigable canal, as well as irrigation branches, and all who wish for the welfare of the district would be glad to see his plans carried out. It is for this cause, I now write to you, as if the project of individual bunds by the Zemindars be carried out, according to the roobookaree of the Shah, it would, necessarily create a class of interests, which would, as a matter of course, be in opposition to the imperial project, and also create a class of *rights* which now no where exist, to hamper the canal authorities in every step of their work. It would also be the cause of an immense amount of injustice; as

* This gentleman was for some time Executive Engineer at the Carramnassa Grand Trunk Road, and did not waste his time.

it is natural to suppose that the bunding of a river could only be carried out by parties of large property or companies of men together:—and the latter could only occur when a number of men were co-proprietors in one estate."

"Such bunds when once recognized as property, would transfer at once the imperial rights of government over rivers and water-courses into the hands of private proprietors, who would use such rights for their own purposes alone, and small proprietors, who were too poor to bund for themselves—or to bribe those who could do so—would be deprived of the benefit of the water actually passing through their own estates, as is even now sometimes the case; and those who know India, and her people best, know how fierce and bitter are the disputes for water, leading to riot and bloodshed, and ending in litigation and ruin."

"*Para.* 4.—For these reasons, I would deprecate allowing zemindars to bund rivers or water-courses, or giving them any rights therein. It might be advisable not to interfere with them in case where no injury to Government or to individuals would be likely to occur: but the granting of a *right* in the matter, or any *recognition of a right* by Government, should I think he avoided, as pregnant with much present and future evils, and likely to produce future embarrassment."

"*Para.* 5.—If it were possible for the native proprietors on the banks of the smaller rivers and streams, to combine and form themselves as far as that stream was concerned into a sort of irrigation company,* under rules laid down

* I should object to this now: as I object to the frittering away of any great project: and I am of opinion that irrigation and navigation combined, to be of any use to the country at large, can only be effectually carried out by the Government, or by large chartered Companies alone. I should prefer the latter, provided Government would only interfere in essentials: leaving all petty details to the management of the Company's own officers. I would however connive at any petty proprietors' project until a Government or chartered one was ripe: as I do not think the Government has any right to step in and interfere with the arrangements of the village proprietors until they are prepared to introduce some manifold improvement, or amelioration.

for the purpose, and under the directions of an irrigation officer: then it might be of service to the country and to the Government also; but any capricious arrangement of the proprietors themselves, I should strenuously deprecate, as being wrong in principle, and as much likely to be caused by ill feeling to some other proprietors, as by any hope of benefit to themselves."

I am however now of opinion that the Government, and the Government alone, (except where the Government delegates the work for expedience to large chartered companies) should undertake the project of irrigation and navigation for India, and carefully preserve the right in all streams as one of the royalties of the state; and should carefully place this clause in all future *amul dustucks*: * and then by distributing the water on a scientific system, and under equitable rules, they can at once confer a great boon upon the country at large, and *double* their own revenue by the same act. I say double the state revenues, but in point of fact the revenue would be a yearly increasing one as increased tracts would be yearly brought into cultivation by the agency of this irrigation: and increased wants, and a large inland trade created which does not now exist.

*Now* there is no possibility of an inland trade except in very valuable articles, because the cost and risk of transport, would far exceed any profits which could possibly be derived from it, which evils a cheap system of inland navigation on canals would wholly obviate, and create a trade which would tell largely on the markets, and on the capital of Calcutta. India is in a transition state, and well for us if we take the opportunity offered us of carrying the public mind into our channels, which can only be done by creating a reciprocity of interests. The people of the coast know us through our commerce—those of the interior know us only through our courts, and our Sepoys, neither

* Warrants of possession.

of which are favourable specimens of British supremacy. Trade is the great binding link between man and man, and between nation and nation, but outward must be fostered by inland trade. In Shahabad and Behar, such inland trade would be of very rapid growth, and would moreover be attended with results which would be of importance, to at least one-third of Northern and Central India, and enable the Railway system above Patna to make a rapid and profitable development. This however brings me to the consideration of canal navigation, a part of my subject which, I think, from the vast results which such navigation has produced in the United States of America, Canada, Holland, France, and England, ought not to be over-looked, but ought always to be considered as a subsidiary portion of any great irrigation system.

Thus canals in India must pay. In European countries, except in Italy, irrigation is not needed: the canals are therefore constructed for navigation, or for drainage (as in Holland) alone. If canals pay for either of these purposes separately, how much more will they pay, when they combine all that canals do in all parts of the world, irrigation and navigation together. Irrigation to enable the farmer to produce the raw material: and Navigation to enable him to export it. Canals properly and economically constructed would be at once the ring of Gyges, the lamp of Aladdin, and the cap of Fortunatus to India.

Navigation would produce a large revenue, sufficient at least to pay the working expenses and interest on the money invested in canals, by a light tax levied upon each boat, according to its tonnage, or capacity for passenger traffic, as is done in England, Holland, and America, by canal companies. An Inland trade would not, as a matter of course, be found ready created on every portion of the line, but would be so in some parts, and its development both in those favoured localities, and on other portions, in

Shahabad and Behar, would probably be more rapid, and attended with more astounding results, than in any other portion of northern India.

This would be effected from the direction which the canals must necessarily take from the state of the partially developed present trade. The fact of the main staples of the trade being such as are urgently required by whole provinces, by the fact that the furtherance of railways in the North-West will create an ever-increasing demand for those staples, and that there is already, with all the difficulties surrounding their transit, a great and ever increasing consumption of these articles: and a demand which can only be limited by the facilities for procuring them, shew that the main lines of canal, which I shall hereafter mention, will *pay* by the profits of navigation alone. This is my main proposition, and I will now try to prove that the idea is a feasible one, from a slight attempt to enumerate those resources, though of course there is no data obtainable, showing how far those resources, are at present worked.

The Soane and the Nurbudda rivers, rising as they do from near the same sources, in central India, and after a long and tortuous course emptying themselves, the first into that great artery of Northern India, the Ganges near Patna, and the other into the Gulf of Cambay on the Western coast, would appear to be especially made by Providence to assist in the development of the resources of that rich territory. These two rivers are perhaps the richest in the mineral resources of their banks and basins of any of the rivers of Hindoostan, and drain vast territories, which in our best maps are marked with that vagueness which shews that our geographers do not know much about them. In both rivers gold washings have been known, and the name Soane from *son* (gold) is said by tradition to have been given on account of the auriferous treasures of its bed. Certain it is, that its sand contains jasper, agate, bloodstone, chalcedony, onyxes,

and crystallizations in abundance, whilst boulders and pebbles of quartz, granite, obsidian, and lava, shews that it has flowed through the greater portion of its course though an igneous or plutonic formation, which is always the richest in mineral deposits.

The Koyle (one of its principal tributaries), and which, joins it near *Rohtasghur*, rises in Sirgoojah, and flows through Palamow and South Behar for nearly the whole of its course, through a rich coal country, containing several coal-fields larger than that of Burdwan, and where the coal in many places crops through the surface soil. The Bengal Coal Company, with the energy and foresight for which their late manager Mr. Biddle was famous, have secured the best known coal-fields, and commenced working them previous to the rebellion. Seventeen pits are, I believe, open, at Rajharrah, and, previous to the rebellion, they used to sell coal, after a land carriage of 40 miles from the collieries to the banks of the Soane river, at four annas per maund,—it cost them ½ an anna per maund at the pit's mouth; and they had laid propositions before government for improving the navigation of the Koyle, so as to allow of the coal being safely brought down that river on boats, and then boated down the Soane to the Ganges. The navigation of these two rivers, must—from their great width, sandy bed, with occasional quick-sands and rocks, changing channels, and rapid rise, with as equally a rapid fall of their waters—always be precarious, although I am of opinion that large flat-bottomed boats of a certain peculiar construction, and not drawing more than a foot of water when loaded, might be constructed to carry heavy cargoes, and yet navigate the Soane almost all the year round:—but these boats must be constructed especially for the purpose, and in the sudden freshes would be liable to some slight risk. The waters of these rivers would however be better employed in facilitating the irrigation and navigation of provinces.

Higher up the Soane, coal-fields again abound on the Southern bank, and the basins of the Kunhur and Rehund rivers in Singrowlee, and the country between the Rehund and the Goput (tributaries of the Soane) is rich in that and other minerals. The Kunhur might, by canalization, be rendered navigable from the Sirgoojah coal-fields, and passing for almost its whole course though a coal conformation, the expense incurred would produce a certain profit. However, the discussion of this forms no part of the present article, and is merely mentioned here as a project which may eventually be made subsidiary to the canal system of Shahabad and Behar, but can be of little use until those main arteries are constructed.

There is however abundance of coal in Singrowlee, which is even now worked to some extent. In a report by W. Roberts, Esq., Collector of Mirzapore, to H. Tucker, Esq. Commissioner of Benares, No. 270, dated 27th July, 1854, it is thus spoken of:—

" *Para.* 2.—The coal formation is situated on the western " boundary of Singrowlee, the northern limit being in the " neighbourhood of the Oundee Hill, latitude 24° 12′ 21″, " longitude 82° 43′ 51″, which is itself of igneous formation " —the southern the Bulleeah rivulet: the eastern limit " has not been exactly ascertained, but it does not extend be" yond the Rehund river. There is no doubt the coal-fields " extend some thirty miles west of our territory in *Rewah*, " *Singrowlee*, and *Burdee*.

" *Para.* 4.—The workings are prosecuted in a bason within " a boundary of Kotah; they go from 40 to 50 feet below " the surface. The aggregate thickness of the coal seams " in 1849 and '50 was reputed at 38 inches. But latterly " some thicker seams have been met with, one is more than " a foot in thickness. It has not been ascertained whether " deeper borings than 20 feet lower than the present work" ings would give a finer description of coal.

"*Para.* 5.—The quality of coal has been acknowledged "to be good, it was found on trial that for steaming purposes "9 maunds was equal to 11¼ maunds of Burdwan coal*. "It was remarked however that the Singrowlee was of a very "friable nature: and will probably be found to deteriorate "quickly by exposure. This however is an inference re-"quiring experience.

"*Para.* 7.—Captain James is clearly of opinion that the "coal is well suited for gas.

"*Para.* 15.—Supposing that there exists a sufficiency of "good coal to supply immediate wants, *still, by reason* "*of the want of carriage, it will not be available.*

"*Para.* 25.—It was whispered to me, that copper was "found in the early days of the British dominion, but the "discovery of it was suppressed, lest the notice of the ruling "power should be attracted to the country;† however I "could discover nothing in the locality thus indicated.

"*Para.* 27.—The entire trade of other articles is estimated "by the *Ahrorah* bunneas at 2½ lacs of Rupees per annum.‡ "They have no reasons for over-rating the traffic, it is pro-"bably much more.

"*Para.* 30.—But it is as the highway from countries "that do possess wealth that I invite attention to Sin-"growlee.

"*Para.* 31.—The further the communications are opened "out, the more will the enterprising trader be encouraged "to visit distant regions, and penetrate to jungly countries "rich in natural and undeveloped resources: even now

* Controller of Government Steam vessels to Secretary to the Superintendent of Marine, No. 893, of 1850, dated 14th May, reports: "*Para.* 3*rd.*—Sin-"growlee coal consumed 34 maunds, residuum 6 maunds 20 seers; or 14 maunds "of each description of Burdwan coal per hour, to 11¼ of Singrowlee."

† It is however now certain that copper exists in abundance in Burdee but the authorities of the Rewah State do not wish it to attract attention.

‡ These gentlemen do not over-estimate for several reasons. Native traders always try to conceal the amount of their trade.

"traders venture to places more than a month's journey "from our frontier.

In the *Friend of India* of the 12th April, 1860, were the following remarks:—

"In a minute by Mr. Read, we find an account of the coal "deposit of the Mirzapore district. Mr. Burke, a surveyor, "discovered at Kotah in 1840, and worked what was known "as the Singrowlee mine, on behalf of a company organized "by the speculative Col. Pew. He met with fair success, "but was much opposed by the officers of the Rewah State, "through which the coal has to pass to the Ganges.

* * * * * *

"Messrs. Hamilton, Higginson and Co. now work the "mineral. In 1856 they sent to the Ganges 185,576 maunds, "and in 1859, 42,109 maunds. The rebels greatly damaged "the works in 1857 and '58. The tract called Singrowlee "lies partly in Mirzapore and partly in Rewah. The area of "the deposit is about 12 square miles; any amount of coal "could be raised, *but there are no means of transport, except* "*by pack bullocks, and these can only be obtained in small* "*quantities.*"

Iron ores of first-rate qualities also abound on the Soane. The Singrowlee iron is even now sold in every bazaar from Patna to Bandah, and is considered the best native iron in the market. It sells at present in the bazaars of Shahabad at from 7 to 10 seers per Rupee. Pergunnah Bidjeyghur is full of per-and prot-oxides of iron, which ores are also found in abundance in various parts of the Kymore range, and only require cheap coal and cheap carriage for them to enter largely into future Railway works. In 1852 I smelted some of the iron, and had it forged into bars as an experiment; and the then Superintending-Engineer of the Grand Trunk Road, Major John Laughton, was so pleased with its density, tenacity, and appearance, that he wished the Government to devote attention to the subject, for the purpose

of procuring indigenous iron for the bridges of the Grand Trunk Road. As however I do not think he was very much in the favour of the governing powers of Bengal, and besides changes in the constitution of the Department of Public Works were then on the tapis, nothing further was heard on the matter. I afterwards sent specimens of the iron ore, and pig and bar iron produced, to the Paris *Exposition Universelle*, and received the thanks of the Central Committee for the same on the 25th October, 1854. These ores are abundant, rich in mineral, and especially valuable as needing no flux to smelt them: at least the native smelters use none: neither did I in my experiments. Navigable canals only are required to give us coal and iron in abundance.

The whole face of the Kymore plateau in Shahabad, is precipitous from Mungeysur Peak to the Kurrumnassa, and present precipices varying in height from 1200 to 300 feet, broken here and there only by the deep indentations through which the hill streams enter the plains; in addition to the oxides and sulphate of iron with which it abounds, it is one mass of red sandstone of quality scarcely inferior to granite for building purposes, and superior to it as being much more easily worked. This stone is already quarried to a very large extent, for mill-stones, pestles, sugar-cane mills, rollers, building-stones, &c., and overlies in its turn a dense non-fossiliferous limestone, the lime from which is well known at Patna, Dinapore, and other river stations. Major Sherwill, the Revenue Surveyor, reports of these quarries as follows :—

"The lime burnt at these kilns (on the banks of the "Soane,) amounting to many thousands of tons annually, is "conveyed away in boats down the Soane river, to all the "principal towns and cities on the Ganges, with which lime "these towns and cities have been built."

I know from personal experience during the past ten years, that the demand for this lime (which is exceedingly pure

and powerful,) far exceeds the supply, but that supply is only checked by the impossibility of boating any extraordinary quantity down such a stream as the Soane with the present native boats, and not by the extent of the quarries, which in all extend for about 60 miles in length, and are really inexhaustible: but to develop the trade fully, a certain navigation is required, which can only be supplied by navigable canals; the lime from these quarries would then supply all the country on the lines of the Ganges and Jumna, Cawnpore and Calpee, down to Rajmahal, and perhaps to Calcutta.

I discovered also some years ago, that the lower and denser stratas of this limestone make excellent lithographic stones:—equal to the German ones. I had it first tried at the press of Shah Kubeeroodeen Ahmud of Sasseeram, but could never recover the stone again from him, as he asserted it had got lost. Be that as it may, the trial was a successful one; and I believe the stone has since been used largely for lithographic purposes in the office of the Surveyor-General of India.

Major Sherwill, the Revenue Surveyor, again reports that the table land of Palamow and Singrowlee, produce coal, copper, antimony, and lead, in abundance, besides cotton til, linseed, teesee, and other oil seeds, while the copper district of Burdee, in the territories of the Rajah of Rewah, is said by the natives to be extremely rich in that valuable ore.

Vitriol works were formerly carried on to some extent in the Soane valley.

Alum shales, chalks, white and yellow, and indurated potstone, is abundant in parts of the range.

The sandstones may be had in any variety, blue, red, greenish, dazzling white streaked and spotted: they are easily worked, but far surpass in hardness and durability the stone of Chunar and Rajmahal: and stone from these quarries has been selected by the Railway Engineers for the

construction of the Soane Railway Bridge at Koylwur: although with such an unruly stream as the Soane, I fear they will not find the transport of their splendid blocks a labour of love. The flooring of the Asiatic Society's Museum in Calcutta is, I believe, from this range. The Soane causeway is also constructed of these solid blocks, while the tomb or mausoleum of Shere Shah, his father and his brother, now of close on three hundred years' construction, testify to its durability.

I may also mention *en passant* the Sienite Rock of Sonar near Sasseeram, of intense hardness, and when polished of dazzling beauty, which if it could be cut, would make durable and lasting chimney pieces, tables, and monuments: and the granite rocks of Bummonee, all of which will play their part, if canals are once opened, and the carriage of heavy materials a possibility.

What more can be required to create a prosperous navigation. Coal, iron, lime, building-stone, lithographic stone, copper ores, chalks, timbers from the vast forests of the Upper Soane, bamboos and poles of various sizes, which are even now floated down the Soane in millions, cotton, hemp, jute, and probably ere many years have passed, flax, indigo, oil seeds, rice and other grains:—silk, tusser, which is indigenous to the Kymore range, catechu, which is invaluable for tanners, and to be had in abundance, lac, lac dye, ghee, wax and honey, all indigenous, while Calcutta, Benares, Dinapore, Patna, and other places, all want these commodities; and the rail from Patna to Delhie must have coal, which can only be supplied them at a reasonable rate from Palamow and Singrowlee. To develope the railway in the North-west, canals in Shahabad and Behar are a necessity, while the convenience of the public, the fertility of a province, and the consequent benefit of its population with the advantage of the railway and coal companies, all go hand in hand, with a largely increased

revenue to Government, and a taxation which all would hail as a blessing, while a contented people, and increased means of communication, would go far to render a future Koer Sing's rebellion an absolute impossibility.

To develope canals on a large scale however, sufficient water to form a constant stream, and to allow for the constant expenditure in irrigation during the dryest months of the year, is requisite. Of this prime necessary, Shahabad possesses more than an abundance, and can spare enough to irrigate the portions of Ghazeepore and Benares South of the Ganges, and bordering Shahabad. Captain Jones, of the Engineers, in his report to the Government of the North-west Provinces, on his operations for improving irrigation within the Terrai lands of Zillah Bareily, and which was published in No. 21. Selections from public correspondence N. W. P., says in—

"*Para.* 6.—One cubic foot of water only suffices to irrigate 50 acres of land,"—by which I presume he means a stream of one cubic foot per second. I shall therefore hope to shew, that for Shahabad, partially Behar, and the outlying portions of Ghazeepore and Benares, we have water enough, and to spare.

I shall come to speak of the reservoirs for the canal heads hereafter, but we will first begin with the rivers which afford a perpetual stream. The Soane river near Rohtass yields a stream in May and June, the dryest months of the year, independently of the vastly larger quantity which percolates through its sandy bed, and which a few miles lower down stream, would again afford a channel of upwards of 350,000 cubic feet of water per minute. The Doorgowtee river, yielded on the 24th April last, passing the Kajar Ghât near Jehanabad, 234,500 cubic feet per hour, or nearly 4,000 cubic feet per minute, while the Kurrumnassa river yields at least double that amount, and the Koodra probably ½ of it: and the Sooreh river yields about the same as the

Koodra. We have thus a certain supply of at least 364,600 cubic feet of water per minute in the hottest months of the year in Shahabad, while Behar has the *Poonpoon*, the *Botanneh*, the *Moorhur*, the *Lilagim*, the *Mohanneh*, the *Dodhur*, the *Tilya*, the *Suckre*, and numerous other streams, of which I have got no data, but we may fairly assume from their appearance that they will give us at least another 60,000 cubic feet per minute.* It will be recollected that these averages are given for the dryest months of the year only. In December, January, and February, the months when the largest supply would be required: the rivers in question would supply three times this large quantity, so that exclusive of head or reservoir water, which I shall hereafter speak of, we shall have at least for Shahabad and Behar during the great irrigation months a discharge available of *one million two hundred thousand cubic feet of water per minute.*

But allowing only half this to be available deducting the other half, for evaporation and filtration (which latter however would not be altogether lost, as it would permeate the soil) and for navigable channels; and this is giving a very wide margin indeed; (as I hope to shew that the reservoir heads would supply the water necessary for those purposes) we have water sufficient on Captain Jone's data to irrigate 500,000 acres or 750,000 pucka beegahs of land,† and in the dryest months of the year, when only special crops, such as sugar-cane, indigo, cotton, and other valuable hot weather crops would require water only; the grain crops having been reaped, excluding the reservoir water, and allowing only half the running water to be available, we have sufficient water to irrigate 166,700 acres or 250,050 pucka beegahs: while calculating by

* I have put down the quantity of water delivered per minute by the Behar rivers far too low:—but it is an error on the safe side: which is always better in matters of this kind than an over-estimate of capabilities.

† This is allowing only one and a half pucka beegah to each English statute acre: but I find since writing the above that the acre contains 1¾ pucca beegahs.

Sir Thomas Cautley's data, that 120 cubic feet per second is sufficient to irrigate 42,000 beegahs, we have in the first instance enough water to irrigate 1,166,900 beegahs, and in the dryest months 389,000 beegahs, by using only half of the running streams and not drafting in any way upon the enormous reservoirs, which nature has almost made for us, and which could be so filled during the rains as to double the supply.

Thus only charging one rupee per beegah for irrigation of each crop, and allowing that only 800,000 beegahs of *Aghunnee* or rice crops to be irrigated, and 800,000 beegahs of *Chaitee* or rubbee crops, and 300,000 beegahs of hot weather crops, as cotton, indigo, sugar-cane millett, spices, &c., &c. we have a clear revenue from irrigation alone to carry to government account at once of nineteen lakhs of rupees, or £190,000 pounds sterling, exclusive of the profits from navigation taxes, which would be great; but as they would only be developed gradually by the opening of the canals, we will only assume that at first they would cover the expence of the current repairs, and pay of necessary establishment, while irrigation and navigation combined would quadruple the wealth of the districts through which they would pass, and would not only give Northern India abundance of cheap coal, building-stone, and lime, at once, and iron in abundance in the future, but would meet many of the wants of English manufacturers, by giving increased employment to capital and furnishing the markets of Manchester, Dundee, and Belfast, with additional supplies of cotton, hemp, and flax, which are now so much needed. I have put down the water-supply and returns at the lowest possible figures, and have even halved those figures, so that much better returns than I have set down would be a certainty.

Shahabad especially (including the outlying portions of the districts of Benares and Ghazeepore South of the

Ganges) appears to be formed by nature for the developement of a vast canal system with comparatively little outlay. It is bounded on the North and North-west by the Ganges: on the South and South-east by the Soane until its junction at the Northern angle of the district with the former river, and its Western boundary is the Kurramnassa River and the hills of the Kymore Range in Zillah Mirzapore. The whole of the Southern portion of Shahabad, or about seven hundred square miles, may be described as a vast watershed of high table lands of hill territory giving rise to numberless streams, nearly all of which fall to the North where their waters are the most required. The principal of these streams, after falling over the steep precipices which front the plains, from heights of two and three hundred feet, and in many instances of more than this, and of all the other streams, would be available for canals, while the deep basins into which they fall, would form the reservoirs.. Almost all these basins have a general character, more or less modified in length and breadth. They form a deep horse-shoe shaped valley, indenting the hills of which the heel of the shoe denotes the outlet into the plains, while the river falls into it over the precipice or cataract at the toe. The sides and toe of the shoe are always steep, dangerously so, in most place inaccessible: and their precipices, are generally from a quarter of a mile to two miles asunder, and varying in length from toe to heel, or to speak more correctly from the water fall to its debouchment, from ½ a mile to twelve miles.

So much was necessary to enable the reader to picture these rivers to himself: we will now begin the list from the South-west, numbering them as we proceed, and premising that the main canal head must commence from the Soane river 4 to 6 miles above the first stream.

*First.* The *Ausonna* river which rises in the Kowreearree valley, under, and taking part of its water from the table

lands of the fortress of Rohtass: it has a short but turbulent course during the rains, is very rapid, and when in flood delivers a large quantity of water. Its high banks afford several convenient localities for dams. It empties itself into the Soane river near Ackbarpore.

*Second.* The *Tootlah,* which rises in and drains the high table land of Kutchoowur, through a deep indentation of which it runs affording for some miles great facilities for the constuction of enormous reservoirs, until it throws itself over a steep precipice forming a large and handsome waterfall in the Tootlah Koh near Renrea; this waterfall is upwards of two hundred feet in height, and when in full play furnishes a grand spectacle. The horse shoe valley into which it falls is fully ¾ of a mile in depth by about a quarter of a mile broad, and would form another grand reservoir at comparatively little expence. After a course of about six miles on the plains, this stream empties itself into the Soane at Aurungabad or Surreyah.

*Third.* The *Kao Nuddee,* which rises in the table lands of Gowreah, norrowly escaping the Tootlah, runs through a deep rocky valley in the hills, admirably suited for reservoirs, then forms the fine cascade of *Manjur Khoond,* and after that falls into the deep wooded valley of the *Dhooan Khoond* by a fine waterfall of about 150 feet in height of the same name, runs through the rock bounded valley for 1½ or 2 miles, and which is from half to three quarters of a mile in breadth, forming a huge natural reservoir, requiring only damming at its mouth, the rocks in no place being less in perpendicular height than from two to three hundred feet:—then between steep kunkur banks, for another mile; and following a winding course of about forty miles, is finally expended in central Shahabad.

*Fourth.* The *Koodra* river, which rises in the same valley, but instead of flowing in a northerly direction as is the case with the *Kao,* goes through the breach in the old Mussulman

dam, and escapes into the plains of Sasseeram, over the noble cascade of *Tarra chanree,* at the pass of that name, where for about half a mile it affords great facilities for a reservoir, then runs nearly parrallel between the Hills and the grand trunk road receiving in its course several minor streams, till it suddenly makes a curve to the north: and crosses the grand trunk road at Koormabad, through the five arches of the fine substantial old Moslem bridge at that place; thence after a course for the main part winding through steep kunkur banks for about fifty miles, it falls into the Doorgowtee River.

*Fifth.* The *Doorgowtee* river, one of the principal streams of Shahabad (and one which might be made navigable up to the hills by locks here and there) rises in the table lands behind the fortress of Rohtass, drains upwards of two hundred square miles of hill country, in doing which it receives upwards of twenty feeders, amongst the principal of which are the *Hutteeadah,* the *Chonkut* and the *Bujra,* then falls from the heights of *Kudhur Kulan* (930 *feet above the sea*) over precipices three hundred feet in height, receives several other falls in its course through one of the most romantic valleys I ever saw, in one of which is the celebrated stalactite caves of *Gooptah;** then falls into the deep valley behind the [illegible]tress of Sheerghur, whence it runs nearly due North [illegible] Jehannabad, on the grand trunk road, then turning sharp North-west runs parallel with the trunk road to *Cheherriah,* where it crosses the road under a splendid iron suspension bridge, called the Doorgowtee

* Gooptah, or the hidden God; from a Hindoo tradition that Mahadeva being pursued by an enemy opened the rock at this place, and hid himself in the bowels of the mountain. The various known windings of the caves are nearly half a mile:—but there are several passages yet unexplored. The whole of the halls and passages are hung with stalactites rendered dark in colour by the smoke from the torches of the pilgrims, who at stated seasons worship here, while several stalagmites in the form of the filthy *lingam,* are formed upon the floor by the drippings from above.

bridge,* with 300 feet of waterway in one main and two side spans, and joins the Kurrumnassa river after a total course on hill and plain of about one hundred miles. The deep wooded valleys through which this river runs before it enters the plains, is banked by limestone and sandstone precipices from three to five hundred feet in height, and varies in breadth from five hundred yards to two miles, presenting abundant choice of places for the construction of dams, with the material at hand to construct them.

*Sixth.* The *Kookoornaye*, a small but rapid stream flowing nearly due north, is already dammed by the Zemindars in several places and empties itself into the Sooreh river after a course from the hills of about ten miles.

*Seventh.* The *Sooreh*, which rises on the table lands of the Chynepore pergunnah, near *Sulya Dahar*, and *Okurguda*, forms several cascades and a waterfall in the valley of Juwar Koh, flows through steep banks past Bubbooah, and joins the Doorgowtee river near Mohunneah after a course in all of twenty-five miles. The deep valleys of Juwar Koh would also afford fine reservoirs, and another dam near *Mussaih*, near the ruined one of Mr. Bruce, would store large volumes of water.

*Eighth.* The *Parei*, a small stream rising in the valley of Ramgurh, and formerly spanned at Ramgurh by the old dam of *Rajbund*, runs north, and after leaving the greater portion of its waters in the Tal of *Mokree* is finally absorbed by other villages after a total course of about ten miles.

*Ninth.* The *Quoirah*, which rises on the table lands of Chynepore, takes several more small tributaries in the deep wooded valley of *Kowah Koh*, runs through a deep bed in the narrow rocky valley of *Chooan*, debouches into the plains between rocks not one hundred and fifty feet apart at

* This is perhaps the handsomest suspension bridge in Bengal; its entrance gateways are beautifully proportioned.

*Oodeerampore* and after a total course of about twenty-two miles joins the *Doorgowtee* river near *Mohunneah.*

*Tenth.* The *Godhooan*, a rapid and impetuous little stream, which rises in and drains the fertile valley of *Quoindee*, and after a course of about sixteen miles joins the Doorgowtee river near the suspension bridge.

*Eleventh. The Kurrumnassa,* in Hindoo mythology the cursed stream, whose water no pious Hindoo will use either for drinking or ablution, takes its rise on the table lands of Rohtass, and runs a tortuous course of upwards of fifty miles, principally in Shahabad, but partly in Mirzapore, drains a larger space of table land than the Doorgowtee, receives several tributary streams, the principal of which is the Gurwut, throws itself over the magnificent waterfall near *Kurkurtgurh* and, after other falls and cascades, flows into the plains of *Kheyra Mugrore* in Zillah Mirzapore, receives two tributaries in Pergunnah Mujwar, Zillah Benares, then forms the boundary between Benares and Shahabad till it enters the Jamminheah district, whence it forms the boundary between the districts of Ghazeepore and Shahabad, and passing through the arches of the splendid railway bridge, empties itself into the Ganges at Chowsah, having run a total course of at least one hundred and fifty miles.*

The eleven streams above enumerated,—after having been dammed in every village they pass through on the table land and forced to pay tribute to hill cultivation for their passage,—yet throw down into the plains of Shahabad for the months of July, August and September, with probably

* The wooded and rocky valleys of the Kurrumnassa, are grand beyond description ; and its waterfalls would well repay the visit of the tourist. I can plainly hear them in the rains from where I write, and they are twelve miles distant.

The handsome stone bridge which carries the grand Trunk Road across the Kurrumnassa is also worthy of notice. It is built of cut stone : and, as stated in the inscripture, was built by its founder "to prevent the feet of pious pilgrims from touching its polluted waters." Sic in orig.

half of June and October an average fall of *one million, four hundred and fifty thousand cubic feet of water per minute:* which principally runs to waste in the Ganges and helps to cause inundation and destruction in lower Bengal: while nature as if to prevent this has, (as already shewn) made them all debouch into the plains, through deep, dark, and wooded valleys, varying from a quarter of a mile to one mile in width, and half a mile to fifteen miles in depth, with three sides, formed by rocky precipices of great height. I measured the fall of one stream from Rohtass and found that its perpendicular fall was 372 feet and then it fell in cascades for double that distance from rock to rock.

What magnificent natural reservoirs has nature almost completed for us! And built them of the most substantial material. It only requires that we should throw dams with escapes across the mouths of these valleys, and where the valleys are deep as in the Ausanna, Kao Sooreh, Doorgowtee, and Kurrumnassa, in several places in each valley, which are all, or nearly so as yet in a state of nature, and we should form vast lakes behind them, and thus from the surplus waters of the rains lay up vast stores of water for hot weather consumption. The Doorgowtee alone could easily form four such reservoirs with a surface of twenty square miles, and twenty-five to fifty feet of average depth, the capacity of the lakes to be formed only being bounded by the height and strength of the dams which would be erected to retain their waters. There could be no doubt of the speedy filling of these reservoirs, enormous as they would be: and any one who has stood on the bridges of the Kurrumnassa, the Doorgowtee, the Sooreh, or the Kao, when these streams have been to use the Scotsman's phrase "angry" would soon find his doubts dispelled, and prove to him, that four times the number of the rock bound lakes could be filled with ease. The enormous waterway in addition to the bridges given by the Road Engineers

for the passage of flood waters would fully bear out this view.

I believe all these valleys have been surveyed by Captain Dickens, but those surveys unfortunately have not been made public by Government. My object is to draw attention to the fact; so that the data of those surveys may be at once made use of. In the mean time a reference to the Zillah maps of Captain Sherwill, revenue surveyor, or to his geological survey map of Shahabad, which is tolerably correct in its outlines, will give a sufficiently accurate idea of some of these natural reservoirs.

The Kymore hills again, on their table lands, might assist in the system of reservoirs by dams across the beds of the streams in various places, where these beds are deep, of sufficient strength to resist all the pressure to which they could be liable, and thus improve those already magnificent table lands to a great extent, while rendering their inequalities of service for the irrigation of the plains below. The beds of the *Tootlah*, of the *Hutteeadah*, the *Doorgowtee*, the *Soorreh*, the *Goorwut*, the *Soorah*, and the *Kurrumnassa* especially might be so treated, and the abundance of good building stone on the spot, would render the construction of such dams both cheap and durable; while the peculiar geological formation of these hills, would render the water thus stored, safe in great measure from loss by filtration, as it is a singular fact that the stratification of the rock from Mungeysur peak to the Kurrumnassa, has a dip inwards of from 15° to 30° a fact first observed, I believe, by Mr. James Henderson, a practical geologist employed in 1855 by Messrs. Burn and Company, railway contractors, and verified by myself.

This peculiar formation, making the surface of the table lands a vast basin, will account for the extreme fertility of some portions of them,* and for the water in many places

* These table lands only require a denser population and application of capital to render them extremely productive.

being found close to the surface, and in some places even escaping from it as at Rehul, Kurtchoowur; Mujgaon &c., while contrary to the usual custom of precipices, even in the rains, no springs are found, or no water escaping from their face. At *Adhourah* water is found at eight feet in depth, in a well, and at two feet in Mujgaon: these are the only two places I know of where wells are found. There is certainly a ruined one in the fortress of Sheerghur, and four large fresh-water tanks on Rohtass 1,705 feet above the sea, which tanks retain their water all the year round: though the steep precipices falling into the plains below, are not more than half a mile from them. The luxuriant tracts of forest land, and the rich grass scattered over the surface of these (they may fairly so be called) rolling prairies, testifies to the general moistness of the soil: while on the plains on the northern foot of these hills water is only procured with difficulty, and wells are deep. I sunk one well at Mullypore* to 84 feet before finding sufficient water, and then only sufficient for drinking, not irrigation purposes. A proof that water is tolerably abundant on the hills without wells, is that the table lands have a considerable stationary population: besides a large roving population of cattle herdsmen, with their herds of buffaloes, as also abundance of deer and other wild animals, none of which could exist without abundance of water: and the basin like formation must be peculiarly favourable for the construction of artesian wells in various localities.

So impressed am I with the beauty and fertility of these shallow valleys in the table lands, that I feel confident they will ere long be the scene of European colonization, and if the canal system recommended either by myself or Captain Dickens be carried out, and hill reservoirs formed, that cotton, coffee, madder, and oil seeds will be great staples of the Kymore plateau in Shahabad and Mirzapore,

* Mullypore is about two miles from the foot of the fortress of Sheerghur.

while coal and iron, which exist as before shewn in abundance, will materially forward their progress in civilization.*

The cost of building the dams, locks, weirs, falls and bridges, together with the necessary Bungalows and other erections for the Shahabad and Behar canal system, would be moderate indeed, as compared with other canals, as all the materials required are at hand in profuse abundance. Building stone, lime and timber, bamboos and flag stones of any size, are cheap, while stone-masons, stone-cutters, and masons used to stone work, wood-cutters and lime-burners, may be had in any number. Sufficient labour in the shape of excavators could be had from the Jungle destricts of south and east Behar and Chotah Nagpore, and thus the main lines of canal with these facilities, should be opened, some in two and all in three years from their commencement. No very heavy works, and no vast aqueducts would have to be built; and no deep rock cuttings as in the Godavery: and better still no great inequalities of ground would have to be contended with. The country every where gives a gentle fall for the proposed lines. The heaviest works would therefore be locks, weirs, bridges, escapes and dams, for the greater portion of which unhewn rubble-stone would be applicable: while millstones for the watermills, which would of course be part of the system, are to be had cheap and in any quantity. Oil seed crushing and cake mills, might also be added at all the escapes, and thus increase the revenues of the canal.

The barracks of the new station of Dearie on the Soane river, and the drains, culverts and bungalows of the grand trunk road from Sheerghatee to Jehaunabad are already

* Coal has not yet been found in the hill ranges of Shahabad and Mirzapore north of the Soane river, so far as I am aware; but exists abundantly in Singrowlee, Agoree and Palamow, south of that river; while iron ores are abundant and of good quality, both north and south; when coal is required and searched for it will doubtless be discovered north also.

built of this material, while the Soane causeway which carries the grand trunk road partly across that river is wholly constructed of local material, and I question whether the hydraulic lime used in that construction has been surpassed in India; while Soane bamboos, Soane piles, and Soane poles were found to be sufficient for its coffer-dams, and temporary bridges, and also for the nalchuks of its well foundations: thus shewing what can be done with cheap and local material, when the will is not wanting to make use of it.*

I will now mention what I think ought to be the main lines of canal. I do not know what directions Captain Dickens has recommended, if any: nor have I the data of accurate surveys to guide me: but I have local experience and that must be my guide. In the mean time I distinctly state, that my object is to call the attention of Government and the public, to the vast question of irrigation and navigation, by which whole Provinces would be benefited: and the Government revenue at the same time largely increased. I have endeavoured to shew, the advantages which would result to the farmer, by the increased fertility of his land thereby induced: the advantages to the planter, in the great staples indigo cotton, and tobacco: to the cultivation of which he would

* The cost of the Soane causeway, (which consists of a thick bed of concrete formed under water and a roadway formed upon it of large blocks of wrought cut stone, weighing nearly a ton each) including material, labour, coffer dams, and temporary works, has not exceeded Rs. 25-0-0 per hundred cubic feet, and first rate rubble masonry may be constructed along the canal line at Rs. 12 per hundred cubic feet: indeed most of the work of that description in culvert on the grand trunk road between Dearie and Sasseeram was constructed at a cost of less than Rs. 7: while as the main line of the canals for Shahabad will for the greater part of its course be even nearer to the hills and consequently nearer to its material, the advantage of cheaper carriage will be in its favour. We must however take into consideration the extra price of labour, which obtains now, but Rs. 15 per hundred cubic feet along the main line for rubble stone masonry of first rate quality, constructed with best stone lime, with sharp Soane sand, or soorkhee, would be an ample margin.

then be able to bring all the advantages and lights of modern agricultural science: while the money of the men of Manchester, Belfast and Dundee would naturally be attracted to a district from whence their wants could be supplied, as both cotton and flax would be largely produced in the fertile lands of Behar. The advantages to Central India are also manifest as affording it a partial outlet for its superfluous productions, and I have no doubt a few years would shew the necessity and advantage of extending the canal lines farther into the interior. The advantages to the railways and steam communication of the north-west is no less obvious, as giving them a regular and unfailing supply of good iron and coal: while the advantage to the coal interest itself is too patent to need more than alluding to. Iron is an acknowledged want of India, and so long as she is dependant upon England for her full supply the full developement of her railway system is impossible. The breeds of cattle would be gradually improved and new varieties introduced: while the now waste, but fertile table land of the Kymore Range, would gradually be brought into cultivatiou and under the influence of the European settler. Waste water power would give the district corn mills, oil mills, saw mills, and manufactories: indeed it is difficult, not to say what interests it would benefit, but to shew who would not be benefited by it. It would benefit all, Government, planter, zemindar and ryot, railway and steam companies, artizans and surveyors: it would be a blessing to the community at large.

I need not say that I shall be glad to see Captain Dickens' plans carried out in their integrity, whatever they may be, as from the data at his command, and from the energy, talent, and hard working practical nature of his character, I feel certain that what he would be prepared to recommend must be good: at the same time perhaps some of the suggestions which I have made as the result of experience may

be useful to him, and meet his views, as it is not possible but that two men thinking of the same subject, must hit upon something which would be mutually approved of. I know that if such should be the case Captain Dickens would have no hesitation in profiting by them.

The main line of canal for the province of Behar should leave the Soane River a little above *Jupla;* thence through *Nubbee Nuggur* in as direct a line as the country will allow to *Gyah,* taking up in its course, the rivers *Poon-poon, Botanneh* and *Moorhur* as well as all other streams, leaving escapes at each river to allow the surplus flood waters to be carried away without injury to the works, and throwing off irrigation channels and constructing reservoirs to retain flood waters, where required. I would also bring another canal from the Koyle River, at the nearest practicable point to the collieries, (should a passage through the skirting hills be attainable,) and if water sufficient could be obtained, carry it as near as possible to Sheerghattee: and thence to join the other main line at Gyah. This line would be a colliery one, but would be an irrigation one also and irrigate a country much requiring such aid.

From *Gyah,* which is already a place of great trade, and large population, the lines should again branch into two, one line striking almost due north to Patna and being thus the means of communication between the parts interior and that river emporium, and conveying to it coal, lime, building stone and country produce of all kinds; and the other main line branching from the trunk at Gyah, after taking up the waters of the *Foolgo* river and its reservoirs near Gyah, passing to *Behar,* there taking up the waters of the *Punchana Nuddee,* and finally emptying itself into the Ganges at or near the civil station of *Bharr.* The irrigation lines thrown off from the main canals would be principally in a northerly, north-west, or north-east direction, but by dams judiciously thrown across these

rivers, before their junction with the main lines of navigable canal, irrigation branches in abundance at a moderate cost would render the intersection of the country perfect, while the quantity of water brought down by these streams in the rains, if only one tenth portion of it be stored, would furnish sufficient supplies, as at the lowest calculations, in the months of June, July, August, and September the waters of the *Poon-Poon*, *Botanneh Moorir*, *Leelagun*, *Mohanneh* and *Dadhur*, to say nothing of other less important rivulets, is not less than two and a half millions of cubic feet per minute:—a vast supply and capable of fertilizing enormous tracts which are now almost waste.

The Trunk line from *Jupla* on the Soane to Gyah would be about seventy miles in length, and the trunk line from the *Palamow* coal fields on the *Koyle*, to the same place, about the same:—then the branch line from *Gyah* to *Bharr* would be about eighty five miles, and the branch line from Gyah to Patna about seventy miles, giving a total of about two hundred and ninety five, say in round numbers *three hundred miles of main canal* in Behar, a district containing, including Patna, *six thousand two hundred and twenty square miles.*

In Shahabad, the main line of canal (as it is known there is a sufficient fall from the Soane at Rohtass to the Ganges at Benares, to allow of easy water communication being constructed) would naturally follow that direction, and thus open the trade of Central India with the North-western Provinces, and give them the coal, lime, and iron so much needed: while at the same time it would collect *all* the waters of the Shahabad watershed, at the foot of the hills, in its own bed, distributing them northwards; and for irrigation from its banks as far as they are available: while the immense natural reservoirs, which I have before mentioned to be formed in the valleys of debouchure of the rivers, would even in the dryest months of the year furnish itself and its offshoots with abundance of water for all purposes.

This grand Trunk Canal as we will call it, will naturally be the most important of the whole system, and should be at least one hundred feet broad in the clear to meet the requirements of the traffic which will be created upon it, (far more so than on the Behar lines). It should leave the Soane at or near the Indigo Factory of *Kyrawah* or the village of *Bandoo*, after the junction of the *Soane* with the *Koyle*, take up all the streams from Rohtass (and they are important), cross the *Ausanna* river by a dam and escape at *Ackbarpore*, running parallel between the Soane and the Hills to a village and factory called *Chundunpoorwah* near to which the waters of the *Tootlah* should be taken up in the same manner: thence to *Namdehrah*, where a branch line would be thrown off northwards, and where the trunk line would turn its stream through the *Dhooan-Khoond* valley to the plains of Sasseeram, passing through the *Tara-Chanree* pass, taking up in that valley the rivers *Kao* and *Koodra*, thence following a nearly north-west course parallel with the grand Trunk Road to the large mart of *Chundharee*: near which it would take up the waters of the *Doorgowtee* river, passing over its bed by a dam and escape, and throwing off another branch canal northward. Following the same north-westerly direction the line should flow about three miles south of Bubbooah where a branch would be thrown off north: and then pass just north of Chynepore (to avoid the *Surreyah spur* of the hills,) to the *Kurrumnassa* river at *Mudadpore*, Zillah Benares; where another branch should be thrown off north, thus having taken up by dam and escape weirs since crossing the Doorgowtee River, the *Koo-koornaye*, the *Koodra*, the *Parei*, the *Quoirah*, the *Gonhooah* and the *Kurrumnassa*: and finally finishing its course in the Ganges at any suitable place between Ramnuggur and the Raj Ghat, where the grand trunk road crosses the river.

This grand trunk line would be about one hundred miles in length: and would convey the lime and building stones

of the Rohtass range, the iron and coal of Singrowlee, the cotton, flax, oil seeds, tusser, lac and other country produce of Central India, with the wood and bamboos of the Soane, to those great lines of internal communication the Ganges, and the East-Indian-Railway at Benares: furnishing fuel for the steamers and locomotives at one fourth of its present price: making old Benares a great commercial entrepot: and filling up a great gap in the commerce of the North-West.

The first branch line in Shahabad, coming from *Namdehrah,* would run nearly parallel with the Soane, through the rich country of central Shahabad, through or near *Jugdeespore* and *Beeheah,* and fall into the Ganges with the *Gangee Nuddee* near *Noorpore.* This branch would be about 80-miles in length, and would be principally an irrigation branch, throwing off its ducts to the north-east and north-west alternately but should always have sufficient depth of water, to allow of at least third class canal navigation: or say boats of about sixty tons burden. This remark is applicable to all the other branch canals recommended in these pages.

The second branch line from Chundharree after taking up the surplus waters of the *Doorgowtee River,* from another dam at *Sukkree* near *Jehannabad,* should flow through *Kochus, Khurghur,* and *Doomraon* to the Ganges at *Woruck,* and would principally be an irrigation line passing through rich tracts, and about sixty miles in length.

A third line striking from the Grand Trunk line at Bubbooah, taking up the spare waters of the *Doorgowtee* again near *Mohumeah* on the Grand Trunk Road, crossing and taking up the spare waters of the Kurrumnassa a second time, would fall into the Ganges near Jamminheah, in the Zillah of Ghazeepore. This also would be principally an irrigation line, and would be about twenty-five miles in length.

The fourth branch line from *Muddapore* would flow wholly in southern Benares and empty itself into the Ganges at or near Sudhan, and would be about forty miles in length.

In addition to these main lines numbers of small irrigation streams would have to branch from each canal to convey the fertilizing water all over the districts; but these would cost little, insomuch that they would generally be constructed by the zemindars themselves, assisted at first by loans from Government bearing a fixed interest: and of gradual construction as the benefits of the scheme become apparent.

The river Doorgowtee would under this scheme be dammed in four places viz. at *Chundharee,* where it would be crossed by the main stream of the grand trunk canal by a dam and escape: again at *Sukkree* or *Jehannabad*: where the escape waters would be absorbed, by the second branch canal: again near *Mohumeah* where its escape waters would be again absorbed by the third branch canal, and again crossed by the third branch canal by a dam and escape, on its way to Jamminheah. The river Carramnssa would be dammed at the crossing of the grand trunk canal and again at the crossing of the third branch canal near Chuchoopore: it is therefore evident that several large reservoirs would be formed in the deep beds of these rivers behind these *bunds,* which reservoirs after supplying the canals could supply several irrigation ducts, for at all events the rain crops, and would probably be able to contribute to the hot weather crops also: at all events these deep ravines being full of water all the year round would naturally cause the water in the wells for some distance from them to rise also: and by their consequent infiltration fertilize a large quantity of ground. It will be recollected also that these reservoirs are independent of the nature-created reservoirs in the hills which have been previously mentioned.

We have then of Trunk lines,

| | | |
|---|---|---|
| In Behar | from Juplah to Gyah, .. .. | 70 miles. |
| „ | „ coal fields to Gyah, .. .. | 70 „ |
| In Shahabad South Benares, | „ Kyrawah or Bandoo on the Soane River to Ramnuggur or Benares, .. .. .. | 100 „ |
| | Giving a total of Grand Trunk lines of, | 240 miles. |

*And of Branch Lines.*

| | | |
|---|---|---|
| In Behar | from Gyah to Patna,.. .. .. | 70 miles. |
| „ | „ „ to Bharr,.. .. .. | 85 „ |
| In Shahabad, | from *Namdehrah* to the Gangee Nuddee,.. .. .. | 80 „ |
| „ | „ Chundharree to Woruck,.. | 60 „ |
| In Shahabad and Ghazeepore, .. | „ Bubbooah to Jamminheah, | 25 „ |
| In Benares, | from Muddahpore to Sudhan, .. | 30 „ |
| | Total of branch lines, exclusive of irrigation channels, .. .. .. .. .. | 350 miles. |
| | Which gives us in all total length of Trunk lines in Behar, Shahabad and Benares, .. .. | 240 miles. |
| | With a total length of Branch lines for Behar, Shahabad, Ghazeepore and Benares of, .. | 350 „ |
| | Or a total of, in all, .. | 590 miles. |

I need now only add, that the district of Shahabad, and part of the Zillah of Ghazeepore and Benares, which would be intersected by these canals, contains (exclusive of the table lands of the Kymore range, which are its watershed) *about four thousand five hundred square miles, or two millions, eight hundred and eighty thousand acres:* which added to Behar and Patna* gives a total of upwards of *ten thousand square miles*, or *six millions four hundred thousand acres*

acted upon directly either for irrigation or navigation : and by opening an outlet for the commerce of the valleys of the *Koyle* and the *Soane*, of the territories of Rewah, *Sirgoojeh, Palamow* and *Chota Nagpore* would affect a territory of ten times that area : and give an increase to the government revenue of at least thirty laks of rupees per annum, with a prospective increase to an indefinite extent, as the resources and navigation of the country became developed : while for military purposes the canal system would be invaluable.

Advantage might also easily be taken of some of the monuments of Mussulman rule in the district, to give irrigation to a limited area, and improve those monuments at the same time. I allude to the three enormous tanks dug at Sasseeram round tombs by Shere Shah, and his successor, around which all the earth from the excavations is thrown up in a high and strong mound or bank of at least one hundred feet in thickness by thirty in height. These tanks are at present mere swamps in the hot weather and poison the atmosphere around them by their exhalations, yet how easily might they be turned to the benefit of the district around.

These tanks are those surrounding the tombs of Shere Shah, and Selim Shah his successor, whose tombs are on high platforms in their centre, and the third one is on the same principle but larger than the others :—the tomb however was never completed, only the foundations of its platform having been laid. Each of these enormous tanks contains at least one hundred acres in its area.

At Chynepore, another old Mussulman City, are also several very large tanks: one in particular called *Rajah Sagur* of at least one hundred acres in extent, and a second, *Rannee Sagur*, of about half these dimensions, in addition to several others.

These and the tanks of Sasseeram might be usefully employed on the Madras system as irrigation reservoirs

for a limited district, and at a small expence: by repairing the already massive banks, where such repairs are required, and in some places raising them also, while the filling of them to the brim with pure water, that is to twenty or thirty feet above the level of the surrounding country, would be an easy matter.

The Sasseeram tanks might be filled from a reservoir at the *Koodra* head: which would be formed by restoring the old bund across the *Turra Chanree* pass, and constructing a raised earthen bank aqueduct or short canal, to the tanks; or the same object might be gained, but probably more expensively, by laying iron or masonry mains, for the same distance. It is about two miles. The supply would be abundant for four months of the year, and the tanks could hold 250,000,000 cubic feet of water.

The Chynepore tanks could be filled in an equally easy manner, by throwing a short dam across the rocky mouth of the *Quoirah,* where it emerges from the Muggurdah pass: and then conducting the water by a short exposed canal or by mains to the tanks as at Sasseeram. The Chynepore tanks could contain about 120,000,000 cubic feet of water.

All the water stored in these tanks would be available for the rice cultivation in the rains, and for a large extent of grain and other crops in the cold weather, and at the same time afford good supplies of drinking water to the inhabitants of these towns of which they are at present wofully deficient. No doubt, but that there are other large tanks in Shahabad and Behar, which might be made use of in the same manner. I merely mention these: as being acquainted with them, and as a suggestion of what may be done, where these or similar facilities are found available.

I will now take leave of the subject. I have cast my mite upon the waters of public opinion, and shall be glad if I have provoked thereby discussion and inquiry into this

momentous subject:—as I believe the resources of India require canals as much as railways for their development: and canals at present even more than railways: but as that is a tender subject, I will avoid the discussion on their comparative merits; for, as a friend of India, I should be glad to see both:—there is abundance of work for both. We shall be centuries yet before we have too many means of locomotion in this vast empire; at present and for years to come, there is abundance of room, for locomotives, quick and slow; for dâk carriages, bullock trains, country carts and pack bullocks; for steamers, fly boats, barges, pattamars and bolios, all of which must, as a commercial speculation, pay their proprietors if conducted with common intelligence, civility and honesty:—while the thirsty soil of vast provinces calls out lustily for eight months in the year, water! water!

---

## *Result of experiment for the reclamation of the Wild Himalayan Silk-worm known as* Bombyx Huttoni.

(*Communicated to the Society by* Capt. Thomas Hutton.)

*To the* Secretary to the Government North-West Provinces.

Sir,—I have the honor to request you will be good enough to submit the following report for the consideration of his Honor the Lieut.-Governor of the N. W. Provinces.

His Honor is aware that with the sanction of His Excellency the Viceroy and G. G. in Council, an experiment was instituted at Mussooree in July 1858, having for its object the eventual cultivation of the wild Himalayan silk-worm known as *Bombyx Huttoni*, and that for this purpose I was desired to form a plantation of the indigenous Mulberry trees, three years being granted in which to finish the work.

The experiment has now been tried for nearly one and a half years, and I am sorry to be obliged to report

unfavourably of the chance of future success. Consequently, as a continuance of this particular experiment would only entail an additional outlay on the part of Government without a prospect of any return, I consider it my duty, although only half the allotted time has elapsed,* to inform His Honor of the real state of the case.

I am led to form an unfavourable opinion from the following circumstances, viz.—

1*st.*—The wild Mulberry tree, when reared from cuttings is found to be of very slow growth, and would require at least double, if not treble, the time allowed, in order to bring it to a size large enough to nourish a sufficient number of worms to insure a tolerable return in silk.

For instance, cuttings of the wild Himalayan Mulberry tree planted in February last with others from the Chinese species, are now not more than a foot, to a foot and a half high; while many of the latter are 8 and even 10 feet in height.

From this circumstance it might be thought advisable to plant the China tree instead of the wild one, but then it has been found that the worm prefers its own forest tree to any other, and thrives better upon it; indeed while the wild tree is almost sure to have a brood of worms every year, the Chinese mulberry, unless far away from the other, will have none. Trees of the wild species which are estimated by the hill men to be five and six years old are not large enough to feed more than a dozen worms. In many of the nursery beds which contained, say, 2,000 cuttings, not more than half a dozen germinated, while the beds of the Chinese species, with the same soil and entirely under the same influences, have nearly all sprung up into healthy trees.

From these facts it is abundantly evident that a plantation of wild trees cannot possibly be formed in three, and probably not in five years.

*2ndly.*—Although commissioned to do no more on the part of Government than endeavour to form a plantation within a given time, I have instituted repeated experiments with the wild silk-worm likewise, in order to ascertain what were the chances of ultimate success.

The silk of this species is decidedly good, but unless it can be procured in quantities sufficient to insure remuneration, of course it would be a waste of time, of money and of energy to proceed with the experiment.

On this point, then, I am decidedly of opinion that while the worm is fed on the trees in the open air, there never can be a crop sufficiently large to pay for the trouble and expense of cultivation; while, on the other hand, so intractable is the worm, that it is quite impossible to induce it to remain in the feeding trays in the house like the Chinese species.

Finding this to be the case I effected a cross between it and the Cashmere stock *(B. Mori.)*, but in every instance the eggs proved unprolific, with the exception of a very few, the worms from which retained all the wandering intractable habits of the wild stock.

I consider, therefore, that both as regards the tree and the insect, the experiment has failed.

*3rdly.*—Having thus done my duty in bringing these facts to the notice of Government, I would at the same time point to Mussooree as fitted to become one of the best silk producing districts in India, its latitude being nearly the same as that of Tche-kiang in China, the province in which silk is said to have been first cultivated; besides that its air, being warm and pure, and at the same time temperate, is the very climate best adapted for the production of good silk.

The fact, moreover, that there are a number of insect forms which are common to Mussooree and China, and that the tea-plant of the latter country thrives well both in the hills and in the Doon,* would lead at once, even in the absence

of indigenous silk spinners, to the conclusion that silk also might be extensively cultivated, at suitable elevations along the ranges of the lower and outer Himalaya, where the average temperature, like that of the best tea-growing districts of China, may be about 73°; but when we find not only a true mulberry Bombyx, a Tussur, an Eria, an Atlas, but four or five other wild species all occuring in different portions of the same district, we are surely not expecting too much when we venture to believe that with proper care bestowed upon the insects, Mussooree will, at no distant date, prove to be one of the best silk producing districts in India.

Experiments already tried with the domesticated *Bombyx Mori* of Cashmere, and with the Madrassee (*B. Crœsi. nob,*) of Bengal, have proved beyond a doubt, not only that the worms thrive well in this climate, but that there is also a ready and remunerating market for their silk.

Although, therefore, nothing can be effected with the wild species of Bombyx, the Government might find the cultivation of the Cashmere worm well worth pursuing,—for

1*st.*—The trees upon which it feeds are of rapid growth, attaining in one year to a height of from 6 to 10 feet: and

2*ndly.*—The worm thrives admirably, and would be sure to produce a handsome return in silk, if cultivated, not as a limited experiment, but, in good earnest, on an extended and liberal scale. A ready market may be found for any quantity of the article, either at Mussooree or at Delhi, at 25 Rs. per seer or Rs. 1,000 per maund; while even in Calcutta the same silk would probably bring in from 20 to 22 Rs. per seer.

It would be necessary, however, to purchase a large tract of land with soil suited to the purpose, and likewise to prepare rearing and reeling houses, as these worms must be fed within doors; and although at the outset this would

entail some little outlay, yet if the scheme were carried out on an extended scale, the returns would soon compensate the speculator for the investment of his capital.

*4thly.*—I would likewise beg to call the attention of Government to the fact that the value of other and indigenous species could at the same time be tested; such as the Atlas *(Sat: Edwardsianus,* White.) and another species which is easily reared, and feeds on the Hill oak *(Q. incana.)* the silk of which is pronounced by the Horticultural Society of India to be very promising.

With so many untried species in the country, several of which might doubtless be rendered useful to commerce, it would be an undertaking honorable to, and worthy of, an enlightened Government, to sanction experiments with one and all.

I have the honor, therefore, to solicit instructions as to what course I am now to pursue, and have &c.

THOMAS HUTTON, *Capt.*
*Supt. Govt. Silk Plantations,*
*Mussooree.*

MUSSOOREE:
*3rd November,* 1859.

---

*To Captain* THOMAS HUTTON,
*Supt. Govt. Silk plantations, Mussooree.*

Sir,—I am directed to acknowledge the receipt of your letter of the 3rd Inst. reporting the result of the experiment on the cultivation of the wild Himalayan Silk-worm which was authorized in June 1858, and in reply to communicate the following observations and orders of the Honorable the Lieut.-Governor.

*2nd.*—The experiment for which expenditure was sanctioned by the Governor-General in the letter from the Secretary to the Government of India, in the Home Department, No. 258 D. the 22nd June 1858, and communicated to this Government under docket No. 3659 D. 7th July of the same year from the Financial Department, has entirely failed,

and must be abandoned. The Lieut.-Governor requests that you will furnish an account current of the total expenditure incurred for communication to the Government of India, and directs that the allowance of Rs. 200 per mensem granted to you for conducting and supervising the experiment shall cease from the date of the receipt by you of these orders.

*3rd.*—The further experiment proposed by you in the latter part of your letter under acknowledgement, involves a considerable outlay in the purchase of land, and the construction of requisite buildings, and cannot, therefore, be encouraged at the present time, when expenditure needs to be retrenched in every department, and in every practicable manner.

*4th.*—His Honor therefore cannot consent at present to recommend the scheme.

(Signed,) A. M. MONTEATH,
*Offg. Asst. Secy. to the Govty. of the N. W. P.*

ALLAHABAD:
*The 28th Nov.* 1859.

---

*To the* SECRETARY TO THE GOVERNMENT N. W. PROVINCES.

SIR,—With reference to your letter No. 2,184 dated Allahabad 28th November 1859, conveying to me the commands of the Lieut.-Governor N. W. Provinces to close the experiments that have been made with the wild mulberry tree and silk-worm of the Himalayas, I have the honor to inform you that his Honor's instructions have been obeyed from the 5th instant, the day on which your letter came to hand.

At the same time I beg leave to point out that in my report I have no where stated that the expriment "has entirely failed and must be abandoned," but simply that I do not perceive, as far as the trial has been made, that there is much chance of ultimate success with this particular

species; it is impossible as yet to decide the question, though having hitherto failed, I considered it my duty to report the same for the information of the Supreme Government; but that I have not yet abandoned all hope may be gathered from a paper published in London in the October Number of the *Universal Review* wherein I have advocated the introduction of the worm into Great-Britain; besides that the crossing having only reached the first stage it is not surprising that the few worms thus obtained still remained intractable. What I do decidedly report is simply that it will be utterly impossible to succeed with the experiment in the very limited time allotted by the Government; and although the attempt to rear the trees in the usual way from cuttings has failed, it by no means follows that more successful results cannot be obtained by sowing the seed.

As, however, there are other species, both domesticated and wild, which can easily be cultivated to a successful issue, it seems a pity entirely to abandon a speculation which must eventually yield a very handsome return; and as his Honor's reluctance to carry it on appears to be based upon the fear of incurring great expense in the outset in the purchase of land and the erection of houses, I venture to make the following advantageous proposal for the consideration of His Excellency the Viceroy and G. G. in Council.

In France no tree is considered sufficiently mature to nourish the worm and produce good silk until it is at least four or even five years old, and I therefore now propose that the Government shall allow me three years from the 1st January 1860, in which to form the plantation, giving me four hundred rupees a month as Superintendent, which shall include both my own salary and the wages of whatever establishment I may deem necessary. This would insure, to begin with, a saving to Govt. of Rs. 600 per annum.

During these three years I will ask neither the purchase of the land, nor ground rent, so that, for the present, no outlay will be required on this account.

*2ndly.*—At the expiration of the third year, as above specified, the Gotv. shall have the option of purchasing the land thus stocked at a fair valuation, and build its own rearing and reeling houses; or of raising my salary and permitting me to build at my own expense to the extent that I may consider necessary, the establishment being still paid by me out of the salary which may then be agreed upon.

*3rdly.*—In the event of the Govt. declining to carry on the speculation after the third year, and wishing to dispose of the plantation, that I shall either be permitted to purchase it myself by refunding the expenses of the establishment during those three years, or in consideration of the land being mine that the sum realised on the sale shall be divided equally between the Government and myself. This at least would effectually secure the Govt. against ultimate loss, since there would be little difficulty in finding purchasers for a plantation once formed and ready for work, and it at once deprives it of all pretext for declining to foster and promote a branch of commerce which, with proper encouragement, must eventually prove of such inestimable value to the State.

I have the honor, as directed, to enclose an account current of expenditure up to 30th Nov. 1859, although at the same time I beg leave to point out that as the annual sum of Rs. 3,000 was stipulated for and sanctioned by the Viceroy, who likewise conferred the appointment upon me for three years, I scarcely think such detailed statement necessary, or that I am sufficiently authorised by His Honor's commands to stop the experiment until His Excellency's wishes have been made known to me.

It will be perceived likewise that I have made no charge for ground rent, although my land has been occupied by

the Government's trees; and I would respectfully beg leave to observe that, if the present experiment, which was sanctioned for three years, and partakes of the nature of a contract between His Excellency the Viceroy and myself, is thus summarily to be suspended, because success has not been attained in only half the allotted time, I shall consider myself as fully and fairly entitled to expect some compensation for the expense and inconvenience incurred by myself and family, in leaving a comfortable residence at Mussooree, and coming down to Jeripance, far removed from medical aid &c., for the purpose of devoting my time and energies to the service of Government, and which has put me to great expense in the purchase of land, which I had every right to expect would be furnished by it.

I have therefore to solicit the favour of your forwarding both this letter and the accompanying report on silk cultivation for the consideration of His Excellency the Viceroy and G. G. in Council.

I have &c.,

(Signed,) THOMAS HUTTON, *Capt. F.G.S.*

MUSSOOREE: *Supt. Govt. Silk Plantations.*

*7th December,* 1859.

---

*To the* SECRETARY TO GOVT. WITH THE G. G. IN COUNCIL.

*Mussooree,* 19*th January,* 1860.

SIR,—I have the honor to submit for the perusal and consideration of His Excellency the Viceroy and G. G. of India in Council, a correspondence entered into with the Government of the N. W. Provinces on the subject of the experiment in silk cultivation at Mussooree sanctioned by His Excellency in 1858.

In forwarding this correspondence I would respectfully beg leave to call attention to the fact that my first report to his Honor the Lieut.-Governor of the N. W. Provinces, was simply for the purpose of reporting progress and

soliciting further orders in regard to the advisability of pursuing my experiments with the wild Mulberry tree and silk-worm of the N. W. Himalaya, and that to my surprise the experiment in all its branches was summarily ordered to be abandoned.

*Secondly.*—That on correcting the erroneous impression under which His Honor laboured, and making a proposal for the consideration of His Excellency the Viceroy, accompanied by a report on the settlement of Mussooree as well adapted for silk cultivation, my request that the said documents should be laid before His Excellency was unattended to, and after a whole month's delay the papers have been returned to me; this explanation I deem necessary in order to account for my not now writing through the ordinary channel.

*Thirdly.*—In consequence of this delay, so long a time must now elaspse before His Excellency's orders can be received that if I attend to the instructions conveyed in the Lieut.-Governor's letter, the present spring planting season will be lost, and I shall, therefore, venture to carry on the usual operations at my own risk until final instructions have been received, and indeed I may observe that as, in consequence of His Honor's orders, the Government Establishment was broken up from the 30th November, 1859, the expenses of protecting the plantation and preparing fresh ground for further planting have been necessarily defrayed by myself.

*Fourthly.*—As the annual outlay proposed in my letter is but small, and no eventual loss can be incurred by Government, I trust my proposal may meet with His Excellency's approval, and when it is further considered that a comparison between tea culture and that of silk, is vastly in favour of the latter there can surely be no good ground for declining the speculation. In both cases capital must lie dormant for about 4 years, the expenses being probably greater in a tea plantation than in one devoted to silk

culture, and then when a return is made, while tea at 7 rupees per seer would yield only 280 rupees per maund, silk on the other hand would easily realise from 800 to 1,000 rupees per maund. During the past year, however, the Deyrah tea sold for no higher than 4 rupees per seer, or 160 rupees per maund, thus leaving a very wide margin in favour of silk.

I shall, however, be guided entirely by His Excellency's wishes, preferring this request, that should the speculation be now closed I may be permitted to consider the trees already planted as my own, in order that I may still further prosecute my researches.

I have &c.,
(Signed,) THOMAS HUTTON, *Capt.*
*Supt. Govt. Silk Plantation.*

---

*To Captain* HUTTON,

*Roorkhee, 7th February*, 1860.

SIR,—In continuation of former correspondence I am directed to inform you, that your letter dated 19th ultimo has been laid before His Excellency the Viceroy, and that His Excellency can hold out to you no further encouragement in the experimental cultivation of the Himalayan silk-worm.

I have the honor, &c.,
(Signed,) GEORGE COUPER,
*Secy. to the Govt. of the N. W. Provinces.*

---

*To the* SECRETARY TO THE GOVT. N. W. PROVINCES.

*Camp Phugwaroo, 31st January*, 1860.

SIR,—In reply to your letter No. 38 A dated 14th Inst. forwarding copy of a correspondence with Captain Hutton, I am directed to state that the Governor General entirely approves of the Lieut.-Governor's decision, directing Capt. Hutton to discontinue the experimental cultivation of the

wild Himalayan silk-worm, and refusing sanction to his further proposals.

2*nd.*—With his Honor's permission, you will be so good as to inform Captain Hutton that his letter of the 19th instant has been received, and laid before the Governor General, but that His Excellency can hold out to him no further encouragement.

I have &c.,

(Signed,) CECIL BEADON,

*Secretary to the Govt. of India,*

*with the Governor General.*

---

*Report on samples of Cotton raised during* 1859 *from foreign seed in the Soonderbunds, Delhi, Kishnaghur, Sonthal pergunnahs, and Boolundshuhur.*

*To the* MEMBERS OF THE COTTON COMMITTEE.

GENTLEMEN,—I beg to circulate, for the favour of your opinion thereon, certain musters of cotton, (8), received within the last three months, as per details annexed, together with the communications referring thereto.

A. H. BLECHYNDEN,

METCALFE-HALL : *Secy. A. & H. S.*

26*th December,* 1859.

*List of Specimens.*

A. Cotton raised in the Soonderbunds from Mexican seed, Received from Mr. L. Tiery. (See his communication of 5th September).

A. A. Kuppas, as above, Ditto ditto.

B. Cotton raised at Delhi from Mexican seed. Received from L. Berkley, Esq. (See his letter of 29th September).

C. Cotton raised at Delhi from New Orleans seed (as above).

D. Cotton raised at Kishnaghur from foreign seed (stock unknown). Received from the Rev. F. Schurr. (See his letter of 3rd November).

E. Cotton raised at Koosma in the Sonthal pergunnahs from Mexican seed. Received from Mr. P. Burke. (See his letter of 11th November).

F. Cotton raised at Koosma from country seed (as above.)

G. Cotton raised at Boolundshuhur from New Orleans seed. Received from C. Currie, Esq. (See his letter of 9th November).

---

With réference to the Mexican cotton seed I received of your Society in October 1858, I beg to state for the information of the Society, the result of my experiment. I sowed about 50 beegahs of land in the same month, but the heavy storm in the end of that month which lasted in the Soonderbunds for about 3 days, caused the river to rise so high as to break some parts of the embankments and to over-flow the lands, by which the whole of the seedlings were distroyed: after the storm was over I sowed again the seed that was left, about 5 seers, on a beegah of freshly cultivated land. The plants thrived well, the pods commenced bursting from the beginning of April, the cotton was picked up to June last and the plants look healthy, with fresh pods at present. The quantity of cotton gathered from the beegah of land is about 4 maunds. I send you 2 seers of the said cotton as sample for the inspection of the Society. This year I am trying the Sea Island cotton seed and the result of which I shall not fail to let you know.

CALCUTTA: L. TIERY.
*5th September*, 1859.

---

I have the pleasure to send you specimens of cotton grown by me. The New Orleans is from the seed supplied by you, and Mexican from that by Dr. Jameson; the plants are yielding well, I think a little later the cotton will be better still. The Pernambuco is only

coming in blossom and will not produce for another 6 weeks. If you think the specimens are fair and will stand competition I will send the kind most approved of. I asked the opinion of a gardener who brought out some American cotton of first quality from Liverpool and he thinks my Mexican cotton equals it in every respect. I have not spared expence or trouble in the cultivation and think it may repay me in some way. I am certain most of this American cotton will grow well in the country, with no more trouble or care than the indigenous crop.

LIONEL. BERKLEY.

*29th September*, 1859.

I think the second picking will produce better cotton still. The early pods are not so large as the late ones.

---

I send you a little cotton, grown in my compound from the seeds which Mr. Douglas sent me several years ago. My Christians have been cultivating some, but their instruments are unfit for clearing it, so they do not know what use to make of it; and they say too, that the fibre is too coarse for their spinning wheels, therefore they have given up the cultivation of it. Perhaps some member of the Agricultural Society knows of a process to render the cultivation of this kind of cotton profitable. If the raw produce, without cleaning, could be sold in Calcutta, I believe the ryots could begin the cultivation, as the trees yield a great quantity and live 4 or 5 years. If you can give me some information on this subject, I shall feel obliged.

KAPASDANGA: F. SCHURR.

*3rd November*, 1859.

---

No. 2. Is a specimen of Dasee cotton. I have seen Dasee cotton of a longer staple, but have never seen a cleaner and more woolly fibre, so I send it, to see what you think of it.

No. 3. Is some cotton from Mexican seed, received from the Chamber of Commerce, pulled a few days ago. I have sent the cotton as Kappas, which will enable you to form a correct opinion of it.

P. BURKE.

---

*Extract from letter dated Böolundshuhur 9th November* 1859, *from* CHAS. CURRIE ESQ. *to* MESSRS. COLVIN COWIE *&* *Co.*

"As I am about to leave this district I take the opportunity of sending you a specimen of the cotton grown from the New Orleans seed forwarded by you and obtained from the Agricultural Society. Of the six casks forwarded the seed of two only germinated and that in very small quantities. I distributed the casks in different portions of the district, but the recipients have almost invariably reported that the seed did not germinate. I sowed about a beegah of land in my own compound, and the specimen of cotton now forwarded is a portion of the produce. The year has been unfavourable, there having been but very little rain and I was obliged constantly to water the cotton field; over the beegah enough plants germinated to have sufficed for half a beegah, the seed was sown in June, and the first yield of Kappas was in September. Since that date there has been a very fair yield every second day, and up to this time about a maund of Kappas has been gathered. A few of the native landholders to whom I gave some of the seed are greatly taken with the plant, and express their intention of cultivating it largely from the seed now produced. I intend taking the *benda* with me to Lucknow, where I am now going, and will endeavour to get its cultivation tried in some of the districts in Oude. I regret that my sudden departure from the district has prevented my sending a fuller report on the result of the experiment. The specimen of cotton will be sent dâk banghy and I shall be glad to hear the opinion formed of its quality by competent judges."

*Report by Mr. James Cowell.*—I have carefully examined the different musters of cotton which you sent to me some days ago, and have to report as follows:—

A. *Cotton raised in the Soonderbunds from Mexican seed.* This is a weak and short stapled sample. It is poor also in strength and complexion. The Kappas of this cotton, marked A. A. clearly shows that it has been sown and gathered at the wrong season of the year.

B. *Cotton raised at Delhi from Mexican seed.*—This is a beautiful sample. It is soft, strong, of excellent staple and colour. Mr. L. Berkley should be encouraged to proceed in growing this cotton, but I am of opinion that the cultivation of the New Orleans variety, C. (of which he has also sent us a muster) would prove more remunerative to him, being of greater and quicker yield of produce. This sample C. from N. O. seed is a superior article in every respect. I assume its value at Home in December last at about 7¼*d.* perhaps 7½*d.* ℔ lb.

D. *Cotton raised at Kishnaghur from foreign seed (stock unknown).* This sample appears to me to be the produce of New Orleans seed, though of remote descent, the seed being of the *green* variety and well furred or covered with wool. It is a good and useful cotton, worth, when cleaned, about 6*d.* ℔ lb. The staple is somewhat short. It would never answer to send the cotton to the Calcutta market in its Kappas or unseeded state. The Society might give the Rev. Mr. Schurr some hints as to the cleaning of his produce.

E. *Cotton raised in the Sonthal pergunnah from Mexican seed by Mr. P. Burke.* This sample of Kappas is of good colour, fair staple and strong, a useful cotton worth when cleaned, about 7*d.* ℔ lb.

F. *Cotton raised in the Sonthal pergunnah from Dassee seed.* This sample partakes of all the characteristics of country stock. It is as usual, harsh and short stapled,

but is strong and of good complexion, worth probably when cleaned, 4½*d.* or 5*d.* ℔ ℔.

G. *Cotton raised at Boolundshuhur by Mr. C. Currie from Mexican seed.* This is a good specimen of cotton. The fibre is of fair length and the colour good. It is not however equal to sample B. produced by Mr. Berkley at Delhi in strength or colour. It is worth probably at home about 7*d.* ℔ ℔.

CALCUTTA: 26*th January*, 1860.

---

*Report by Mr. H. A. Hurst.*—Annexed I hand report on the samples of cotton forwarded by you to me for examination.

Those marked B. and C. are of the description chiefly required by the Manchester manufacturers who could consume almost any quantity at a reasonable price.

I would strongly recommend that the whole of these samples should be forwarded to the Cotton Supply Association for their information, and would gladly take charge of them for that purpose.

CALCUTTA: 6*th February*, 1860.

A. Cotton raised in the Soonderbunds from Mexican seed. Very short stapled, coarse, and bad coloured cotton, would be unsaleable in the English market. A. A. is still worse. The only good quality possessed by these kinds is the ease with which the fibre separates from the seed.

B. Cotton raised at Delhi from Mexican seed. Good coloured, long stapled valuable cotton worth about 7¼*d.* ℔ ℔.

C. Raised at Delhi from New Orleans seed is also most valuable cotton. It has a slight red tinge arising most probably from damp weather when plucked, but should fetch about 7*d.* Both these samples appear to have been slightly injured in cleaning but the fibre is exceedingly good.

D. Raised at Kishnaghur from foreign seed. Fair stapled saleable cotton separating with ease from the seed, value about 6*d.* ℔ lb. Could not be sold unless cleaned.

E. Raised at Koosma in the Sonthal pergunnah, from Mexican seed. Fair stapled cotton of good colour but separating with difficulty from the seed.

F. Raised at Koosma in the Sonthal pergunnahs. Dassee seed. Very short staple adhering with great tenacity to the seed, value about 4*d.* ℔ lb. but in ordinary times unsaleable in England.

G. Raised at Boolundshuhur from Mexican seed. Fair stapled, strong cotton of indifferent colour; saleable description but worth 1*d.* ℔ lb. less than C. and B.

---

*Report by Mr. C. A. Cantor.*—On examining the musters I find,

A. Very short stapled.

A. A. Bad colour and the staple greatly worse than A. muster.

B. Beautiful, clean and long stapled.

C. Beautiful, clean and nearly as long a staple as B. muster.

D. Good colour, short staple.

E. *Not* quite so good a colour as D. muster, and short staple.

F. Very short staple.

G. A slightly yellow tinge, good staple.

---

Cotton Supply Association Offices, No. 1, Newall's Buildings.

*Valuation of samples, received from the Agri. and Horticultural Society, Calcutta.*

| | |
|---|---|
| No. 1. Raised at Delhi by Mr. Berkley from Mexican seed. | Tender in staple but of good color and well cleaned, 5¾*d.* |
| No. 2. Do. from N. Orleans seed. | 6¼*d.* If rather finer would be worth 1*d.* ℔ lb. more. |

| | |
|---|---|
| No. 3. Raised at Koosma (Santhal pergunnah) by Mr. P. Burke, from Mexican seed. | 5 Good staple. This sample well cleaned would be worth ½*d.* to 1*d.* ⅌ ℔. more. |
| No. 4. Raised at Boolundshuhur by Mr. Currie from New Orleans seed. | 5½*d.* Good marketable cotton. |

*Signed on behalf of the Committee of the Cotton Supply Association.*

G. R. Haywood.
*Secretary.*

Manchester:
17*th April,* 1860.

---

*Mode of rearing the Tusser silk-worm and of dying the silk as pursued by the Teloogoos of the Hyderabad Country.*

(*Communicated by the General Committee of the Madras Exhibition of* 1859.)

*To the* Secretary of the Agri.-Horticultural Society.

*Calcutta.*

Sir,—I have the honor, by desire of the Honorable the President and Members of the General Committee of the Madras Exhibition of 1859, to annex copy of a Resolution of 10th January, 1860.

C. P. Molony, *Captain.*
*Secy. Madras Exhibition of* 1859.

College Hall, Madras:
16*th February,* 1860.

Read the following letter from the Local Committee Hyderabad describing the way the tusser silk-worm is reared and the silk dyed by the Teloogoos of the Hyderabad country, with receipts for making the dyes.

4. Resolved that the best thanks of the Committee be conveyed to the Local Committee Hyderabad for this valuable and interesting report; also that copies of the same be forwarded to Lieutenant Mitchell, Reporter on Class IV,

Sec. VII, animal substances used in manufactures, and to the Agri.-Horticultural Societies of Calcutta, Madras and Bombay with specimens of the moths &c. and that the Hyderabad Local Committee be informed how their interesting communication has been circulated.

---

*To Capt.* C. P. MOLONY,

*Secretary Madras Exhibition.*

SIR,—With reference to your letter, dated 23rd August last, with communication from Lieutenant Mitchell, Reporter Sec. VII, Class IV. appended, calling for information regarding the Saturnia (Bombyx ?) Paphia or tusser silk moth, I have the honor, by desire of the Local Committee, to furnish you with such information as, up to this time, I have been enabled to procure.

*2nd.*—Syed Mohdeen Padshah, the intelligent Talookdar of Wurrangul, at which place the manufacture of tusser is carried on to a considerable extent, has supplied me with the following information.

*First Stage.*—In the hot season in the months of Chittur and Vysak, the cocoons of the tusser chrysalis are a little larger than a pigeon's egg and are called by the Teloogoo people "pissree kaia." In the season when they gather the flowers of the Mowah* they search for the tusser cocoons in the jungle and generally find them on the trees called Muddi† "Arvi Chunnungag" and wild Ber fruit tree;‡ having tied them in bundles, they hang them up with great care in their houses. When thunder occurs at the beginning of the rainy season, the moth passes out of the cocoon, the male moth's wings being red, the female yellow.

* Bassia latifolia.

† Terminalia alata ?

‡ Zizyphus Jujuba.

Some of the moths copulate spontaneously, but generally the male and female require to be brought together for

that purpose. The mode of approximating the sexes is as follows :—

I give it with its superstitious remarks in the words of my informant.

"People of the castes called 'Nyakwarram' and 'Koia-"warram'* who are experienced in "this matter, fast the whole day, and "avoid all personal and ceremonial defilements, after which "during half an hour at sun-rise they join together the "male and female moths. If the man be unclean they "aver that the moths will not approach each other. After "approximating the moths, they leave them thus, till even-"ing, nor do they separate them, but permit them to "remain together until they separate spontaneously."

* Inhabitants of the Ramghur Circar.

On separation the male moths are put aside, and the female moths in numbers from 2 to 20 are placed in a basket made of the leaves of the Palmyra† or the teak tree.‡ The mouth of the basket is closed with leaves. They do not make use of other leaves because they aver that they do not keep out cold, and the effect of cold is to prevent the moths laying eggs. Round the baskets they plaster cow-dung and then hang them up, for a period of from 7 to 9 days in a place clean and sheltered from the wind. After this each moth deposits some 50, some 100, some 200 eggs. The color is white, and in size they resemble a grain of jowaree. As soon as the female lays eggs she dies.

† Borassus flabelliformis.

‡ Tectona grandis.

*2nd Stage.*—The eggs§ are kept in the same basket 8 or 9 days when the young caterpillars appear. The caterpillars at first are about the size of a large black ant. These young caterpillers are carried into the jungle in the same baskets and are placed upon little bushes of the "Muddi" and "Chungag," the branches of which

§ When the ova are laid in the month "Assar" they are kept till the succeeding season; the eggs of the next season, they keep till the 3rd season; the eggs of the 3rd season however cannot be kept till the

ensuing year as the heat destroys the foliage of the trees and the caterpillars die.

are cut with a knife and bent down, taking care that they do not touch the ground; care must also be taken that they are not cut so as to impair their vitality, otherwise the leaves (on which the caterpillars feed) will become dry. If necessary the branches thus prepared, are supported by cleft-sticks. Should the branch touch the ground there is danger of the caterpillars being eaten by ants; on the other hand should the branch be too high, there would be danger at the time of collecting the caterpillars of their falling upon the ground. Therefore the baskets are hung up, so that they can be easily reached by the hand. Around the trees they spread plenty of ashes to prevent ants reaching the trunks; moreover they station an active and intelligent person to protect the caterpillars from kites, crows and other birds, snakes &c.: when the caterpillars have devoured all the leaves the breeders proceed as follows :—

Baskets are made of the Roussa grass,* in which are placed leaves of the "Muddi" and "Chungag," the caterpillars are then picked up and put into them.

* Andropogon calamus aromaticus.

These baskets are hung up, as the former ones were, upon other trees, thus they manage for two months, after which the caterpillar becomes fat and inactive, and lays yellow colored fens for one day, next day it eats nothing.

3*rd Stage.*—The caterpillars having remained a whole day without eating, begin to weave their cocoons with white threads, which issue from their mouths. In one day they spin their cocoons, some of them "pass water in the cocoon, and die soon" others however remain alive.†

† 6 Cocoons are sent 3 female and 3 male. The male chrysalis cocoon is known by its size.

The mode of making tusser silk is as follows. The people of the caste of "Wundarwarram" and "Koiawarram" breed the moths; the price is fixed according to the amount

of the produce and the market demand; from 3 or 400 to 7 or 800 cocoons are sold for one rupee.

The purchasers mix dhobies' earth in water; then they tie up in a cloth bundle the ashes of the Sesamum plant* or castor-oil tree† or pulas wood.‡ After which they take two earthen pots the mouths of which are of the same size, into one of these pots they place dry paddy grass§ or Sawan,|| and then introduce the above mentioned bundle of ashes, they next place in the pot the tusser cocoons, and fill the pot up with the water in which the dhobies' earth had been mixed. Over this pot, thus prepared, they invert the other pot luting them carefully together to prevent the escape of steam. The luted pots are then placed upon the fire, and heat applied, until all the fluid has dried up, and disappeared. They then take out the cocoons, which are properly "baked" and subject the rest to a repetition of the same "baking" process. When dry, the cocoons are thrown into pure water, from one end of the cocoon the thread is then drawn out and reeled off upon on instrument¶ for the purpose.

* Sesamum orientale.

† Ricinus communis.

‡ Butea frondosa.

§ Oryza sativa.

|| Panicum Sp.

¶ I have been promised one of these instruments and will send it when it comes to hand to the General Committee.

The tusser insect lays eggs thrice in the year.

*1st.*—From the beginning of the Month "Asar" till "Sravun."

*2nd.*—From the beginning of "Sravun" till "Esory."

*3rd.*—From beginning of "Esory" till "Booshun."

The tusser silk is of two sorts, the first and better sort is that obtained from cocoons from which the chrysalis has not escaped. The second and inferior kind is the produce of cocoons from which the chrysalis has passed. The first is sold at 1½ seer for 12 Rs. the second sort at 1½ seer for 10 Rupees.

### *Dying.*

The dyers dye tusser silk all colors except green. The processes are as follows:—

#### 1. *Red Dye.*

Take:—

| | | | |
|---|---|---|---|
| Tusser silk, .. | .. | 1½ | Seers. |
| Lac, .. | .. | 1¼ | „ |
| Old tamarind,* | .. | 1½ | „ |
| Alum, .. | .. | 15 | Tolas. |

* New tamarind is injurious to color.

First moisten the red lac with water, grind it and mix the fluid with the ground alum, and divide the whole into three parts. Steep the tusser silk. The tamarinds are tied up in a bundle and boiled well, then the tusser silk is put into the boiling fluid and boiled also well. In this way the silk must be boiled three times, when it acquires a red color, afterwards it is moistened with 15 tolas of sweet oil (Sesamum) to render the color "fast." Price of the dyed silk is from 5 to 6 tolas per rupee.

#### 2. *Orange Yellow Dye.*

Take:—

| | | |
|---|---|---|
| Tusser silk, | 1½ | Seers. |
| Gool-i Kajsoo†, | 1½ | „ |
| Alum, | ¾ | „ |
| Chunam, | 1 | Seer & 10 Rs. weight. |

† Butea frondosa.

First moisten the tusser with water, then having ground the alum add it to the moistened silk. Add the "gool-i kajsoo" water (The gool-i kajsoo is kept in water two or three days until a blackish scum appears on its surface, this scum is skimmed off and the water which remains in that added to the prepared silk) and boil well. The chunam is then added and the whole divided into three portions. The tusser silk is successively boiled in each of the three portions, and a yellow color is the result. Price from 6 to 8 tolas per rupee.

3. *Black Dye.*

| | | | |
|---|---|---|---|
| | Tusser silk, | 1 | Seer, |
| Potash prepared from leaves of Butea frondosa | Pulas khar, | 9 | Seers, |
| | Chunam, | 2½ | " |

Moisten the pulas khar and chunam for six hours. They then take a pot, make a hole in the bottom, put into it a leaf of the Palmyra, and aver that the pulas khar is mixed with the chunam, they then place this pot above another one, and having poured into it 10 seers of water, allow the water thus mixed with pulas khar and chunam to be strained into the lower pot.

This water is divided into two parts. Into one is put ½ a seer of well ground indigo and mixed with it the fluid of indigo called "torsul" used by tailors. This indigo fluid they put into a large pot (large enough to contain three common pots of water) the other portion of the water mentioned above they divide into two parts, to one they add, one seer of Juggur seed* with an equal portion of clean water and placing it on the fire they boil it well, so that the glutinous juice may pass out, and be dissolved. This glutinous fluid is added to the indigo water. The remaining part of the khar water is put also into the indigo water and the whole kept for two days in the shade. Into this fluid the tusser silk is placed and kept in it one or two hours.

* Morinda tinctoria.

The price of tusser silk dyed black is the same as that dyed red.

4. The tusser silk is purchased by merchants from Hyderabad, Armoor Juggiapet. &c.

5. The following specimens have been sent:

1. Ten caterpillars preserved in rectified spirits.
2. Cocoons of male moth.
3. Cocoons of female moth.
4. Baked cocoons.
5. Cocoons from which the moth has escaped.

6. Tusser first quality.
7. Ditto second ditto.
8. Red tusser silk.
9. Deep orange colored tusser.
10. Black tusser silk.

6. Further inquiry will be made into this subject and the result duly communicated to the General Committee.

I have the honor to be, &c.,

(Signed,) G. SMITH, M. D.

HYDERABAD RESIDENCY: *Secretary.*

*3rd January,* 1860.

---

*On Sorghum Saccharatum or Sugar Sorgho. Translated by* COL. F. C. BURNETT, *from a German Kalendar published at Leipzig in* 1859.

This plant, which is most lucrative and useful in many ways, has precisely the same requirements with regard to climate, soil, manure, and cultivation as Maize; where, and under whatever circumstances this reaches perfection, the Sugar Sorgho does the same.

The ripe properly cultivated seed is of a longish spherical shape, and is composed of one grain out of two beards, it is nearly covered with a bright black pellicle shewing in one spot the reddish yellow of the grain; by thrashing the black pellicle is generally separated, the grain then looks of a reddish yellow color, so that it might be supposed there was a mixture of unripe, or different kinds of grain, but it germinates quite as easily without the husk. The grain is best if it can withstand the strongest pressure of the finger, however all Sorgho seed although apparently good has not the same power of germinating, some is quite deficient. Water is a good method of separating grain of different specific gravity, and consequently of different germinating capacities, from each other, those seeds intended for sowing should be soaked in water, after 24 hours skim those that

remain floating on the top and throw them away, use only those remaining under the water, which by this time will have been soaked enough for sowing, this should be done about the end of April or beginning of May.

Sugar Sorgho should be cultivated in ridges three feet apart, and a distance should be allowed of 1½ feet from plant to plant, as however many of the seeds do not germinate it is better to sow the seed with a drill machine and afterwards thin them according to the fertility of the soil so that about 12 or 14 plants will remain in a quadrametre. Hoeing should be attended to as in all cultivation in ridges. The Sugar Sorgho being of the Millet species generally produces 6 to 10 stalks out of one seed and even as many as 20 in good fertile ground; at first it exactly resembles Maize and distinguishes itself afterwards only by its spreading appearance, the stalk reaches 12 feet in height, and is often more than an inch in diameter at the bottom of the stem; the leaf is very similar to the Maize.

In countries where the seed does not attain maturity it will still be much sought after as a very nutritious, abundant, and wholesome fodder plant for all kinds of cattle, from its producing a rich supply of cut fodder from August to November at a time when clover is over. The riper it is, the more eagerly do animals feed on it and the greater are its nourishing properties. As a fodder plant Sorgho surpasses the generality of green crops, the ripe seed contains a flour which when mixed with wheat meal gives a good, well tasted, baked bread. The pollard of the Sorgho grain contains a coloring matter resembling Madder called Sorghotine, which is of a beautiful rose color. Out of the stem is expressed a very rich juice which serves for the manufacture of sugar and spirit; also by a mixture of the refuse of pressed grapes a sort of wine is prepared.

At a meeting of the Academy of Science at Paris M. Dumas, a Member, gave the following account. "M. Leplay

had made a grand trial in his spirit manufactory in the south of France during the winter of 1857-58, and worked up 26,000 cwt. of Sugar Sorgho cane, this was reaped in the vicinity of Toulouse, Montaaban, Carrasonne and Narbonne, the sowing had taken place at different times in the months of April, May, June and July, that sown in April and May produced well ripened seed, that sown in June was not quite ripe, while that sown in July had not developed its seed."

By Leplay's clever practically conducted experiment the following peculiar properties were discovered, viz. that the increase of the sugar contained in the plant rose so considerably with the formation of the seed that the ripe stalk produced double the quantity of alcohol as the unripe, to obtain the greatest produce the Sorgho must be reaped when the seeds are dark colored but not quite hard and the stalks are still green. In an unripe state like sugar cane, the plant contains more uncrystalized, and in a ripe state more crystalized sugar, and the Sorgho often produces more than 15 ℘ cent. when ripe. This particular property is of great importance in the South of France where Sorgho generally ripens its seed. With regard to its judicious preservation Leplay has found that drying by means of a hot current of air brings the Sorgho into a state in which it can be exported and stored up for a long time without harm, by drying it loses 70 ℘ cent. of its weight and then is easier managed for both the manufacture of sugar and spirit, Leplay has a particular method for both. Boussingault thus observes, "Sorgho gives a very rich harvest amounting to from 40 to 50 cwt. per hectaré (one hectare is nearly 4 Prussian acres) and contains a very nutritious flour, the produce in seed, sugar and spirit gives large profits, moreover the substance taken out for sugar and spirit does not take away from the fertility of the soil and gives a valuable return to the farmer: the value of

crystalized sugar is much greater than that of alcohol, and it is a subject of congratulation that nature here, contrary to all known principles, has out of uncrystalized sugar made crystalized, and at the same time has accumulated flour and azote in the seed of the plant."

The seed of the Sorgho was sent by M. Montigny, the French Consul at China, to the Geographical Society, and its acclimatization was effected in France in five years; it is a most valuable acquisition and has excited the greatest interest in the sugar market; it has also given a great impetus to the Agriculture of the North where sugar beet root has become so great a source of profit.

## *Mode of rearing the mulberry Silk worm in the Tinnevelly District.*

*(Communicated by the General Committee of the Madras Exhibition of* 1859.)

*To the* SECRETARY AGRI-HOTICULTURAL SOCIETY,

*Calcutta.*

SIR,—I have the honor, by desire of the Honorable the President and Members of the General Committee of the Madras Exhibition of 1859, to annex copy of a Resolution of this date.

C. P. MOLONY, *Capt.*

*Acting Secretary Madras Exhibition of* 1859.

*Resolved.*—On comparing the cocoons and insects kindly forwarded by Mr. Levinge Collector of Tinnevelly with those in the Exhibition of the Tussa silk they would appear to the General Committee to be cocoons and insects of the true silk which is more valuable than the Tussa silk.

*Resolved.*—Also that a copy of letter No. 1,007 dated 14th October, 1859, from Mr. Levinge Collector of Tinnevelly, and a specimen of the cocoons, silk-worm and moths received therewith, be forwarded to the Agri-Horticultural Society, Calcutta, and Mr. Levinge be informed of the way

in which his specimens have been distributed and the efforts made by the Committee to gain further information regarding this valuable silk.

---

*To Captain* C. P. Molony,

*Offg. Secretary Madras Exhibition of* 1859.

Sir,—With reference to your letter of the 23rd August last, I have the honor to inform you that as there is only one kind of silk-worm known in this district, the samples of silk you refer to as having been sent from here, are of course the produce of that species.

2. The native name by which the cocoons are distinguished here is "Pocunda."

3. The Tamil name of the tree on the leaves of which the worms feed is "Cumbooly Cheddy" or "Thippily navel Cheddy."

4. The silk produced from these worms is manufactured to a very limited extent in this Province almost the whole being exported to the neighbouring Districts of Madura and Tanjore.

5. The maximum and minimum rates at which the silk is sold here, are 11 and 8 rupees respectively per viss of 120 rupees weight.

6. A sample of the silk-worm male and female, has been this day forwarded by banghy to your address as requested.

I have &c. &c.,

(Signed,) V. H. Levinge,

Tinnevelly Tencausey : *Acting Collector*.

15*th October*, 1859.

[In acknowledging receipt of the above letter Captain Molony was informed that the specimens which were sent with it belonged to *Bombyx mori*, the worm which yields the silk of commerce; that it is the variety known in Bengal as the "Desee pooloo," or monthly worm, in contradistinction to the variety known as the "Boroo pooloo" or

annual worm: the Tinnevelly cocoons are inferior in size and color to those obtained in Bengal from the monthly mulberry feeding worms.

Capt. Molony was requested to send a skein of the Tinnevelly raw-silk, with such particulars respecting the rearing of the worm as he could obtain, namely whether fed in the open air on the trees, or in houses, and the botanic name or names of the trees on which they feed; with any further details in regard to the culture which Mr. Levinge could afford. This request has been kindly complied with as the following communication will shew.]

---

*To* A. H. Blechynden, Esq.,
*Secretary Agri-Horticultural Society,*
*Calcutta.*

Sir,—Adverting to your letter of the 17th January, 1860, I have the honor, by desire of the Honorable the President and Members of the Madras Exhibition, to annex copy of a letter, marginally indicated, from the Collector of Tinnevelly and sample of the silk as requested by you.

C. P. Molony, *Capt.*
*Secretary Madras Exhibition.*

College Hall:
12*th April,* 1860.

---

*To Captain* C. P. Molony,
*Secretary Madras Exhibition, Madras.*

Sir,—With reference to your letter dated the 21st February, 1860, and to the extract annexed thereto, I have the honor to forward a small skein of the raw-silk required by the Secretary to the Agri-Horticultural Society at Calcutta, and to give the following information.

*2nd.*—The cocoons reserved for breeding are placed in trays made of reed or bamboos, till the worms come out of them; the worms are immediately placed in other trays and in a very few hours produce eggs which in about

eight days yield numerous worms of so small a size that they are obliged to be gathered into a fresh tray by a soft feather. They are now fed six times a day with tender leaves of the "mulberry" cut up in small pieces. As these worms grow larger, they are fed oftener, and shifted into other trays, so that they might not be crowded together. Within about forty days after they come out of the eggs they are full grown and form themselves into cocoons which are thrown into hot water, in view to the worms being destroyed and the silk removed.

*3rd.*—The culture of the mulberry plant is very simple like the rose, cuttings from the plant are set in ground previously dug and manured for the purpose, and watered whenever required. The cuttings gradually take root, and shoot out, and in about five months become full grown plants, which last for 8 and 12 years. The oftener the earth is broken up, manured and watered, the better the plants grow.

I have &c.,
(Signed,) J. SILVER,
*Collector.*

TINNEVELLY :
24*th March*, 1860.

*Report by Mr. W. G. Rose.*—The specimen of Madras silk which you have sent me is the worst of the kind I have ever seen. It does not even look like silk, but more like some vegetable fibre.

The sample is very badly reeled, if it was properly reeled, it would be worth more than double its present value.

CALCUTTA : 26*th May,* 1860.

*Report of Cotton Committee on certain bales of cotton submitted to compete for prizes offered by the Society.*

*(Submitted and adopted at the monthly general meeting of the 16th May, 1860.)*

In accordance with the resolution passed at the last monthly meeting of the Council your Committee have

examined the bales of cotton sent in to compete for the prizes noted below,* and beg to report as follows:—

In the first place they regret to observe that only one party,—or rather one firm,—namely Messrs. Fischer and Co. of Salem, in the Madras Presidency, have entered as competitors for these premiums. This firm, as will be seen from their letter appended to this report, have submitted 3 bales containing 900 lbs. of raw cotton, raised from Bourbon seed, to compete for the first named prize of Rs. 1,000 and the gold medal: and 2 bales, containing 494 lbs. of Oopum cotton, to compete for the second prize of Rs. 500 and gold medal.

Your Committee have no hesitation in offering their opinion that the Bourbon cotton now submitted is a "good merchantable cotton," and entitled to the premium offered for the production of at least 10 maunds of such cotton raised from foreign seed of the black seeded long staple kind. They are also of opinion that the Oopum cotton does not meet the necessary requirement, viz. a "substi-"tute for the Upland Georgia or New Orleans cotton of "the United States of America." But to test this point fully they beg to recommend that the bales be sent to the "Cotton Supply Association" at Manchester for their opinion and report; and that, in the event of their report coinciding with your Committee's, the cotton be sold and the proceeds carried to Messrs. Fischer's credit. They would also further recommend that the Bourbon cotton be sent to the same Association for sale, and that the proceeds of such sale, with a report on the quality of the cotton, be communicated in due course to the Society.†

* For the production of at least 10 maunds of good merchantable cotton, raised from foreign seed of the black seeded long staple kind Rs. 1,000, and gold medal. For the production of at least 5 maunds of cotton raised from indigenous seed, of a quality superior to that now exported, and such as is likely to prove a substitute for the Upland Georgia or New Orleans cotton of the United States of America, Rs. 500 and gold medal.

† These bales were duly forwarded through the kind assistance of Messrs. Mosley and Hurst, Honorary Agents for India of the Cotton Supply Association.

The Committee beg to add that Messrs. Fischer have submitted, as required by the conditions, a statement of the mode of cultivation and cost of the above kinds of cotton, but as there are one or two points in it which appear to the Committee to be obscure, they recommend its return for these points to be clearly established.

Though not referred to them, the Committee have had before them a letter from Mr. Malcus Agabeg, (received by the Secretary since the last Council meeting,) forwarding a quantity of clean cotton raised in the Soonderbunds from New Orleans seed, and requesting to be informed if it could be allowed to compete for the prize. Even if this cotton had not been received after the time fixed it could not enter the list for competition for the first prize, as it is not a black seeded long staple kind; and of course it could not be brought into competition with indigenous cotton.

C. A. Cantor,
H. A. Hurst,
M. Rustomjee.

Calcutta:
30*th April*, 1860.

---

*To the* Secretary of the Agri.-Horticultural Society.
*Metcalfe-Hall, Calcutta.*

Dear Sir,—With reference to your letter of the 7th June, we beg to inform you that the following are the quantities of Messrs. Fischer and Co.'s cotton, we have sent for the Calcutta Exhibition:—

| *Oopum.* | | | *Bourbon.* | | |
|---|---|---|---|---|---|
| | | lbs. | | | lbs. |
| 1 | Bale | 250. | 1 | Bale | 300. |
| 1 | ,, | 244. | 1 | ,, | 300. |
| | | | 1 | ,, | 300. |
| 2 | | 494. | 3 | | 900. |

At the same time were sent two bales of cotton raised at Delhi by Mr. Lionel Berkley from New Orleans and Mexican seed, of which he had previously sent musters, so favorably reported on by the Society's Committee, See their Report *ante* pages 419, 420.—Eds.

And enclosed we send you Messrs. Fischer and Co.'s statement regarding the cultivation, price, &c., of these cottons, and we trust it will give you all the particulars required.

MADRAS : BINNY, & *Co.*
18*th August*, 1859.

---

*Statement.*

In consequence of the advertisement by the Agricultural and Horticultural Society of India, of a list of premia for 1858, for certain articles of raw produce, among others of cottons, which we saw in the Fort Saint George Gazette of the 11th June, 1858, we, in January 1859, sent Messrs. Binny and Co. for despatch to Calcutta the quantity of cotton required as we supposed, but afterwards discovering that it was Bengal and not Madras maunds, by which the Society calculated, we made up the difference in March.

As required by the advertisement we now proceed to submit to the Society a statement of the mode of cultivation and cost of the same.

The cotton sent is of two kinds commonly called Bourbon seed and Oopum cottons, both grown in the district of Coimbatore, the first is exotic raised from foreign seed, the second is indigenous raised from country seed.

The choice of the land for either cotton is the first and most essential particular to be attended to. On the rich black soil alone will the Oopum cotton thrive. This soil should be entirely avoided for the Bourbon seed, nor will a poor and sandy soil answer for it. It would grow in the intermediate qualities of soil, but the red loom and calcarious soils are the most preferable ; the more lime there is in it the better.

The first of these cottons was grown in the Talook of Errode, the second in the Talook of Oodoomalacottah close to our factories at either place, in soils chosen as above.

With respect to the first or Bourbon seed cotton.—The land having been chosen, it was well manured with cattle manure and by penning sheep upon it, and as soon as rain fell in April or May, it was ploughed and cultivated, the seed was sown broad cast a month or two after, the ground between the plants was ploughed to kill the weeds. About a fortnight later the plants were thinned to about 3 feet apart, intervening distance of the plants depends entirely upon the caprice of the planter, but we would recommend their being, 4, 5, and 6 feet apart from each other. The land was then again ploughed when the plants were two months old, and in December or January following the crop comes in and it will yield again in July and August, and so twice a year.

This plant is a perennial but as the produce falls off in quality and quantity with age, it is renewed every 3 or 4 years.

The neighbourhood of hills should be avoided as the dampness of the atmosphere in their vicinity is injurious to the produce and deteriorates the quality of the cotton.

The best way of calculating the cost of the cultivation of this cotton is to take it for 3 or 4 years. Say 3 years.

| | | | |
|---|---|---|---|
| The tax of land fit for this cultivation for 3 years at Rs. 2 8 per acre per year, is Rs., .. .. .. | 7 | 8 | 0 |
| For manuring, .. .. .. .. .. | 5 | 0 | 0 |
| For ploughing, .. .. .. .. .. | 3 | 12 | 0 |
| For seed, .. .. .. .. .. .. | 0 | 2 | 0 |
| For fencing for 3 years, .. .. .. .. | 7 | 0 | 0 |
| For ploughing and weeding 1st year, .. .. | 3 | 0 | 0 |
| Ditto ditto 2nd „ .. .. | 2 | 0 | 0 |
| Ditto ditto 3rd „ .. .. | 2 | 0 | 0 |
| Total Rs., .. | 30 | 6 | 0 |

This will yield in 1st year, 2 Shuttays or bullock loads of seed cotton.

| | | | | | | |
|---|---|---|---|---|---|---|
| Ditto | ditto | 2nd | ,, | 4 | Ditto | ditto, |
| Ditto | ditto | 3rd | ,, | 3 | Ditto | ditto, |
| | | Total, | .. | 9 | | |

A sixth is given for picking the cotton, which leaves 7½ which at 8 Rs. each, the present market value, is equal to 60 Rs. giving a profit for 3 years of Rs. 29-10-0

This cotton and even the Oopum has been as high as 10 and 12 Rs. the Shuttay from failure of crop and scarcity of cotton, but the produce having been small, the profits were not so great as a superficial observer might suppose.

Next with respect to the Oopum or indigenous cotton. This cotton is grown on the black clayey soil of which there are such extensive tracts in Southern India. The land should be well ploughed and manured, if manure can be had, but generally it is not manured. The seed is sown in September and October broad cast, and when the plant is about half a foot high the field is weeded, and the plants thinned leaving them a foot or two apart. It yields in March and April, and its yield both as to quality and quantity depends on rain in January and February. If the rain fails the crop will be a defective one.

The cost of cultivation is as follows:—

| | | | |
|---|---|---|---|
| Land tax per acre, .. | 3 | 8 | 0 |
| Manuring, .. | 3 | 8 | 0 |
| Ploughing, .. | 3 | 0 | 0 |
| Seed, .. | 0 | 2 | 0 |
| Fencing .. | 2 | 0 | 0 |
| Weeding twice, .. | 2 | 0 | 0 |
| Total Rs., .. | 14 | 2 | 0 |

This will yield about 3 Shuttays or bullock loads of 250 lbs. of seed cotton, of this one sixth is given for picking,

leaving 625 lbs. which at 7 Rs. the Shuttay is 17½ Rs. thus giving the proprietor a profit of Rs. 3-6-0 the acre.

Both cottons were cleaned or separated from the seed by the native hand churker, and then hand picked by women and girls.

It takes from 8 to 10 Shuttays or bullock loads of seed cotton according to the season to give two bullock loads or one candy of clean cotton.

| | | | |
|---|---|---|---|
| Bringing this quantity from the villages to the factory costs, .. .. .. .. .. | Rs., 2 | 0 | 0 |
| Ginning and hand picking from 8 to 10 Rs. | | | |
| Packing with good gunnies, .. .. .. | 8 | 8 | 0 |
| Establishment, .. .. .. .. .. | 2 | 8 | 0 |
| Carriage from the factory to Madras, .. .. | 12 | 0 | 0 |

The seed will sell for 5 or 6 Rs.

There is a prejudice against the seed of this Bourbon cotton as food for cattle, that it is not nutritious as the seed of the Oopum and Ladom cottons and that it purges cattle.

The above calculation is for average good year. The seasons have been so bad for the last 2 or 3 years that crops have failed extensively. Cotton has been from 30 to 50 per cent. dearer making up in price for deficiency of produce. This crop is as precarious a one as any other agricultural produce, and more so if any thing.

FISCHER, and Co.

11*th August*, 1859.

---

*A few remarks on Silk-worms raised by Monsr.* PEROTTET, *at Pondicherry, from Cashmere eggs.*

(*Communicated by* HENRY COPE ESQ.)

*The* SECRETARY AGRI.-HORTICULTURAL SOCIETY OF INDIA.

SIR,—Sometime in December I had the pleasure to send to Mons. Perottet, Director of an experimental silk factory at Pondicherry, a small supply of Cashmere silk-worm's eggs.

I was not a little surprised to learn by return that some of the eggs were hatching on reaching their destination. It was clear to me they must have been exposed to some adverse influences in transit, and I begged him to give me further particulars. I have now been favored with these and as they may be of interest to the Society, with reference to the general introduction of the Cashmere, to renew the used-up Bengal worm, I do myself the pleasure of sending you a translation of Mons. Perottet's letter to me. It is dated *Pondicherry 18th February*, 1860.

Sir,—I hasten to send you some cocoons produced by the worms obtained from some of the eggs you were so good as to send me, *in compliance with the wish expressed in* your letter of the 27th January.

"These cocoons, compared with those you obtained in the Punjaub, will no doubt enable you to judge whether their abnormal hatching can have had any effect on the scantiness of their produce. They are certainly large, but irregular in shape and not thoroughly stuffed out. They are hard, consisting of a fine, strong, brilliant and elastic fibre. I have no doubt that if properly spun they would produce a silk of the best quality.

Your surprise at hearing that some of those eggs you sent me had commenced hatching immediately on the box in which they came being opened leads me to infer that they produce annual worms, or at least that they hatch at long intervals. Even now they are coming out at the rate of 25 and 30 a day. I fear, therefore that this kind cannot be kept up in its pure state in our province on account of the height of the temperature which keeps the mulberry tree on leaf nearly the whole year round. Unless these eggs be crossed, that is unless the moths obtained from these eggs be not crossed with those already naturalized here, they would dry up before, long before the proper period of their hatching;

but when crossed we should obtain a hardy worm breed of which the cocoons would be well filled and formed of a strong and brilliant silk. It is thus that I hope with the assistance of your beautiful breed entirely to renew that which I now use and which I have possessed for several years. I wish you could do the same but I fear that any eggs I might send you would hatch before they reached their destination. I may be more successful with those I have already crossed and as soon as I have a sufficient quantity I will dispatch a supply. My own breed is the Milanese which produces small but remarkably rich cocoons. I will also send you some of these cocoons by post in a few days so that you may be able to judge their quality and the difference existing between the two.

One of the characteristics of your breed is the entire absence of viscid matter or gummy substance on the eggs deposited by the female moths, so that they do not stick to the paper or cloth on which the moths are placed, but roll off the paper or cloth as soon as they are deposited, on the same being raised. Is this the case with you? I shall thank you for information on this point. I shall also be thankful by your telling me in what manner your full grown cocoons are caused to spin? Is it on branch or in hollows as is done by the natives in all parts of India. I cause mine to spin between two bamboo divisions with a span about the thickness of a thumb apart. These divisions or bridges are broken in places so as to admit the finger, and my worms spin admirably in this manner. Your worms would not spin thus, but wasted all their silk without making any cocoons nor would they spin within brushwood placed for their use. I was obliged to enclose them in paper bags where at last they formed the cocoons of which I send you some. I am therefore induced to believe that with you they spin in bamboo baskets. I shall be thankful for any information on these points. Accept. &c.

The absence of all viscosity in the eggs is apparently a distinctive character in the breed of which I sent the eggs to Mons. Perottet, but I cannot account for the difficulty raised by the worms as to the locale of their spinning. The Cashmeries never remove them from the basket in which they have been fed, but leave them amongst the small branches placed for their use towards the end of their career. They generally go as deep as they can under these, so as to carry on their operations unseen and preferring any forks of the branches that may be available.

I have now a considerable number of worms under care. Some reared from acclimated eggs, some from eggs most obligingly sent me from a small stock obtained from Bokhara, and grown from Cashmere eggs of 1859. On all these I hope to send you a few notes* which shall be accompanied by samples of the respective cocoons. Up to the present moment, the 16th day of the existence of many of them, they are progressing most favourably. Not a symptom of disease amongst any of them. The very day the first eggs began to hatch a few mulberry trees began to put forth their new leaves.

UMRITSUR: HENRY COPE.
*8th March,* 1860.

---

## THE GARDENER'S NOTE BOOK—No. 4.

*Culture of Asparagus: communicated by* J. W. B. MONEY, ESQ.

If you have just received the seeds from England, shut them all up at once in a good sized glass stoppered bottle, (paper and all) and keep them so until the month of August; you can during that month sow them, in flat ground, each seed 6 inches apart, and they will germinate

* For some interesting details of Mr. Cope's experiments, see Proceedings of the Society for May and August, 1860, pp. xxxiii. and liii. Appendix. *Eds.*

in a fortnight or 20 days; when the rain is very heavy, have some mats over the plants, to protect them; about the 1st or 15th of October, or when the plants are two months old, they will be from 9 inches to 1 foot high, and the rains generally end about the 15th of that month (October); the plants will then be ready to transplant to permanent beds, in the following manner:—

Take the richest ground you can possibly get, (no earth can be too strong for asparagus,) and take care that no rain can lodge where your beds are to be; dig holes 3 feet deep, one foot inside either square or round, according to the shape of tiles you can procure, (the holes should be 2 feet apart either way) then put tiles in the bottom of each hole, then put over the tiles 1 foot and 6 inches of the finest earth you can procure with manure, mix them well together, (old cow dung is very good) your 3 feet holes are now reduced to 1 foot and a half, then transplant your young plants in these holes, take care to water evening and morning, (not too much water at a time), never allow the earth near the roots to get hard or *caked*, turning the earth up every 2 or 3 days will prevent it. After a fortnight's transplantation, or about November, young new shoots will appear; as these get strong so do you gradually fill the holes with earth, and about the end of January your holes ought to be quite filled up and even over the surface of your beds, and in February, and March, and April, you ought to have very fair asparagus for the table: but it is the second year that they get to perfection. You ought to change your plants and beds every three years; always allow only 3 or 4 shoots of each plant to go to leaves, and always destroy seeds when they appear. When your plants are about 16 or 18 months old, keep the holes opened for about a week in either December, or January, down to the roots, and put a chittack of salt to the roots of each plant, this will improve the colour, flavour and the size of

them. It is very easy to force asparagus when they are out of season by opening the holes and watering them with liquid manure and then shutting the holes after a week very fine asparagus will appear in any time of the year, but it quite weakens the plants and even kills them. March, April and May, are the months to use them and the finest asparagus always show themselves 4 or 5 days after a Nor-wester.

When I spoke to you of elephant manure it was when alluding to the artichoke plant. Very often in this country artichoke plants (particularly American seeds) grow to a tremendous size for 3 or 4 years and then die, without ever having had a head on; in these cases elephant manure nearly always brings them on to heads when every thing else fails.

## *A list of Timbers at the Port Blair Settlement; recognised by the Burmese as common to Burmah.*

*(Communicated by Dr.* THOS. THOMSON.*)*

No. 1. Thengan, *(Hopea odorata.)*—Trees eighteen and twenty-four inches in diameter by sixty in length, grow on hills, good for boats and stands water well, is used for building native craft on the Tennasserim coast both for planks and timbers. The resinous oil is used by the Burmese doctors as an application to wounds. In house building it is not used (Mason says); it is the most valuable indigenous timber in Tavoy and Mergui, and is best for canoes;—is up for house building.

No. 2. Sha Tha, *(Acacia catechu.)*—Same size, grows on hills, used for house building both for boards and posts, sawn stands wet.

No. 3. Pyemna layzot, *(Lagerstræmia ———.)*—The long leafed Becuna, found on hills, two to four feet in diameter, has a fruit used as a local application for Apthoe of the

mouth, good for house building, boards and posts and also for oars.

No. 4. Pen-lay-oung, (*Xylocarpus granatum.*)—Grows along the edge of salt water creeks, small timber used for crooks and timbers of vessels, gun stocks &c., fruit used in dysentery, is exceedingly astringent and is regarded by natives as a specific for cholera.

No. 5. Murinee Auga,—Grows to about eighteen inches diameter on banks of creeks, wood tough, used for blocks crooks &c.

No. 6. Muduma Tha,—Bark used for dying nets, used for house posts, and also instead of bamboos; seldom found larger than six inches in diameter, grows in mangrove swamps.

No. 7. Bew Tha, (*Rhizophora gynorrhiza.*)—Mangrove, found here as large as eighteen inches in diameter, used for house posts, rice mills &c., hard and lasts well, good for steam boat fuel, furnishes hard and durable timber.

No. 8. Toung-kana-zoe, (*Bassia* ——— .)—(Timber sent dock-yard). Hard and heavy wood, grows on hill sides and near, but not in salt water; found as large as three feet in diameter by 50 or 60 feet long; used for all purposes where a very heavy hard wood is wanted. Has a nut used in dysentery, seeds yield a fragrant oil.

No. 9. Theet zee, (*Melanorrhoea usitatissima.*)—Black varnish tree; grows to three feet in diameter with about 50 feet height for timber, good for house posts or thick boards, not plentiful.

No. 10. Pyn-ga-doe, (*Inga Xylocarpa.*)—Excellent timber for posts, larger than the last, excellent for furniture, rather heavy; fruit used as an astringent for sore throat, not plentiful, the hard wood is as impervious to ants as teak.

No. 11. Pyn Ma, (*Lagertræmia* ———.)—Grows to about same size as last, furnishes good boards, fruit used for same purpose as No. 3, tolerably frequent in the jungle.

No. 12. Bambooay, (*Careya arborea.*)—Grows to about same size as last, only the heart 6 to 8 inches in diameter, used for posts or for small house, wood requiring strength. The leaf used as envelope for Burmese cheroots. A useful timber for house building.

No. 13. Padouk, (*Pterocarpus* ———.)—(Timber sent to dockyard.) Andaman red wood, this is a lighter wood than the Padouk of Burmah. The Burmese wood is used for carriage spokes &c. and lasts well.

No. 14. Toung Baing,—Used for canoes, found to about 24 inches in diameter by fifty feet for timber: not plentiful, used also for cart wheels, and large buttresses, preferred for this purpose, has a fruit.

No. 15. Kunyen Bew,—Wood oil tree of Maulmain, useful for boards when not exposed to weather, found 4 to 6 feet in diameter and more than 100 feet in length for timber, very abundant, produces wood oil but not so abundantly as on the other coast.

No. 16. —— Ner, (*Dipterocarpus lævis.*)—A variety of the last, better wood, very abundant.

No. 17. ——— (*Abrus sp.*)—

No. 18. Kanna zoe, (*Heritiera attenuata.*)—Grows to twelve inches in diameter and from fifty to eighty feet, timber not used, produces (April and May) a fruit much eaten by natives. Fruit on strings like currants, size larger than large dry nutmegs.

No. 19. Letpham,—Silk cotton tree. Aborigines construct their canoes of this wood.

No. 20. Penlay ka sheet,—Variety of silk cotton, has red flower and thorny bark.

No. 21. Kyoung-ya,—Timber not used, is like the last. fruit eaten. A tree of it at back of Major Sankey's house, Maulmain.

No. 22. Toung-za-lay, (*Garcinia Roxburghii.*)—Timber seldom used, fruit eaten.

No. 23. Palowah,—Timber not used, fruit eaten.

No. 24. Gnoo bhen,—*(Cassia fistula.)*—Timber seldom used.

No. 25. Sooy-dan,—Grows to about twelve inches in diameter and height of thirty or forty feet, good for gun stocks &c. where tough wood is required..

No. 26. Taing bhen, *(Nauclea Cadamba.—)*—Timber not used, leaf and fruit used medicinally.

No. 27. Gangan,—*(Mesua ferrea.)*—Grows here to twelve inches in diameter and fifty or sixty feet in height, good for house boards and posts.

No. 28. Tay bhen, *(Diospyros kaki.)*—The bark and fruit used for tanning nets, timber not used.

No. 29. Oungliuay bhen, *(Euphorbia sp.)*—Used in medicine, the wood used sliced to mix with tobacco, makes it *mild.*

No. 30. Deedop.—Species of silk cotton, timber not used.

## *Notes on the Flora of Bourbon: By Capt.* W. H. Lowther, *Indian Army.*

*Saint Denis, Reunion,* 12*th June,* 1860.

I trust that during this calm season, my packages by the *Perigny* will have reached you safely; very lately another fine ship has been condemned, being the 14*th* victim of that memorable hurricane! I have just returned from the interior; the famous mineral waters did me no good, and the humid climate a great deal of harm: but the beautiful atmosphere of the coast here is setting me all right again, and I do not think that, Madeira alone excepted, I could find a more temperate, or soothing residence in the whole world than St. Denis, and its environs. On the 14th ultimo, in capital health, I started in a hired carriage for the interior, the road passing along the coast, through several small populous towns,—the principal objects along the

route in pretty numerous succession being the immense sugar manufactories, and the surrounding cultivation consisting of cane alone, fringed with picturesque plantations of the *Pandanus*, the leaves of which are so useful to the sugar planter. After changing horses twice, we suddenly turned off the high road into a pretty rural lane, and commenced the ascent of a very steep ridge, where we soon found ourselves within the gorge of the mountains. The road winds along, very dangerously picturesque, on the brink of a precipice, at the foot of which a roaring torrent foams in full force, and down the almost perpendicular heights on either side rush cascades of every shape and size;—the "horse-tail" falls, dropping almost perpendicular from a source 900 *feet high*, being the most remarkable. The atmosphere as you may suppose is exceedingly misty and vapoury, and I felt the transition of climate most uncomfortably. The vegetation all corresponding, huge ferns, mosses, and grasses clothing the steep sides of the mountains down to the road, where sunshine is somewhat scarce. I left the carriage after a while, and walked leisurely the 10 remaining miles to the Sanatarium. The flying bridges, ingeniously constructed of timber, several hundred feet above the torrent, are well worth a close inspection, and for years they have stood the test of heavily loaded vehicles of every description. The black depths below are fearful to contemplate, and owe their origin to a tremendous volcanic eruption at no very distant period. The entire vegetation, with scarcely an exception, is Indo-Chinese:—excepting two palms and a *Datura*, I had seen every thing before in Assam, to the very weeds among the tea,—the very same disgusting *Solanum* described in one of your late Nos.* and the same troublesome composite plant, so difficult to eradicate. There were the same ferns, the Parasitic on the old trees, the stately

* See page 290 of this volume.—*Eds.*

tree-ferns in the moist hollows, and the countless species among the stones; there were the same *Orchideæ* crowding the branches in the forests, and all the identical grasses in their favourite localities, including even my ancient enemy the "*Bun-gootee*," delighting in attaching itself to man and beast:—and *there*, last not least, was the China tea in wild profusion, and determined not to be choked in the villainous society of brambles and briars. My Assamese servant boy shouted in ecstasies as he pointed out to me the "*Soom*" tree,—on which they feed the "*Eria*" worm in his remote country; and at every step we came upon old acquaintances, not omitting the legions of raspberries, and strawberries offering themselves to be gathered during this little journey. The Thermal Establishment *professes* to cure nearly every malady under the sun, but to my certain knowledge many patients came away who had submitted themselves to a longer regular course of baths and potations, and on whom not the slightest effect was perceptible. The climate is miserable for invalids, perpetual rain and very little sunshine in the finest weather, for the locality is shut in by nearly perpendicular mountains on all sides, being at the bottom of a deep gorge, and the little wooden pavilions are so far apart, and built in such precipitous places, that after dusk the inmates dare not venture out; and so there is very little social intercourse, or society. To my thinking the mineral ingredients are very small in quantity, and a glass of good soda water with a tea-spoonful of ink therein would be quite as salutary. I *bathed*, and *drank* like a fervent devotee for full 18 days, and gained nothing. I found some beautiful Camellias (especially the very large *white* kind) and some magnificent roses in the gardens there. The volcanic soil seems highly favourable to horticulture, and in the estate of a gentleman to whom I took a letter, I found growing within a few yards of each other, the

oak, rose, and olive of France, *Colvillea racemosa* of Madagascar, tea, Camellia, and Loquat of China, coffee of Arabia, plantain of India, and *Passiflora* of S. America covered with fruit. This will give you a small idea of what Bourbon *might be.* In the above garden nearly all the ground is devoted to coffee, which however does not yield large returns there being too much moisture and too little sunshine to ripen the berries. There are also 16,000 tea plants, most of them many years old, and in the finest possible condition. They were covered with blossoms and seeds at the period of my visit. No one in the Island has ever attempted the manufacture of tea, although the plant is now thoroughly naturalized. The soil is exactly the same as that of the very best lands in Assam being a gritty ferruginous loam. I noticed a very ingenious mill for cleaning coffee, moved by water power, and working three stampers which husk the berry very perfectly, and require but little attendance.

I send you three pieces of Madagascar cloth made from the palm of which I sent you a large package of seeds. I also enclose some seeds of a very nice fruit sold in all the markets, in appearance and flavour like a *tomato,* in shape like *Diospyros.* Herewith too the seeds of a very fine Passion flower, bearing fruit in appearance and size like a lemon, the growth and foliage like *P. laurifolia.* M. Richard calls this *P. Mauritiana;* it is indigenous to both Islands, as also two other species, which I did not find in fruit but will do my best to procure. I have an invitation to a very superior Botanist in the interior, and intend to go and pass a short time at his beautiful estate. He is A. I. in botany, possessing not only a very extensive herbarium and library, but also a fine living collection, the result of many years devotion to the pursuit. I shall try and procure from him the beautiful little "Palm of the Comor Isles:" there are very few in the Island, and these few were solely obtained by stealth as the Comor people are very jealous monopolists: a friend near

me has three in his enclosure: they are very like the wild date of Upper India, are stemless, the fronds rising almost perpendicularly out of the ground, and when at maturity are said to furnish cocoanuts most abundantly. I was with M. Richard this morning in the gardens, and was delighted to find many seeds ripening, and that he had commenced his collection on our behalf.

He has given me a *carte blanche* on his plants, several beautiful things are just coming into bloom. *Quassia amara* very handsome, and giving seeds too; various *Apocynæ;* among them a lovely crimson *Echites* from Madagascar; a *Begonia* with tall erect stems; a splendid S. American *Justicia* like *Rhinacanthus,* colour crimson, and very free flowering; several fine *Ruellidæ;* and last not least that prince of terrestrial Orchids, *Angræcum.*

The two fine textile Aloes too are in flower, and yielding seeds; and I shall not forget these curious leather leaved novelties for our garden. Bengal will suit them exactly as it will, doubtless, two-thirds of the Madagascar vegetation. In Paris just now this new fibre is in great repute.

The Island here swarms with useful *Malvaceæ.* I particularly noticed on the low hills, *Urena lobata,* and *Sida rhomboidea,* and that they attained a length and size greatly superior to our Indian plants: but no one here cares for any thing, as M. Richard says, *except sugar, and dollars.*

There are many kinds of coffee, both indigenous, and naturalized. The two most famous are a wild, arboreous species, now very rare, and C. *Zanzibarensis* is cultivated, but not common. *Café du Roi* is a scrubby bush bearing a small green berry in great profusion, only drank from its comparative cheapness as it requires very little care.

*C. Mocha* is cultivated, and most sought after, but is dear, the plantations having all been cut down long ago to make room for sugar, some of the landholders seeing the price

of the berry swell up again, are planting. C. *Bengalensis* occurs in the jungles. I expect to receive the sample of prime Vanilla in time for this despatch: but Creole promises are "trifles, light as air," and I am beginning to value them accordingly. This is the end of the harvest, and yet, I know of two estates still giving their 3 to 500 *pods per diem!* The tobacco is famous, the fine soil and climate combined must be the cause of this superiority, for there is no secret in the preparation whatever; it is the most simple imaginable, being merely the compressing of the leaves into the smallest possible compass by a cord, and the cutting into fibres is beautifully performed by a Negro with a spoke-share. The plants all appear to belong to the identical species we cultivate in India.

*23rd June.*—Since the commencement of this letter I have been into another quarter of the Island for a few days, a totally different climate from this, although only a few hours journey. St. Paul was the capital more than 50 years ago, in the good old times of English occupation. I was delighted with the place: it is a long straggling rural town with scanty population, and the denizens generally poor, for which reason empty villas abound at from 20 to 30 Rupees a month and simple cottages for *half*: besides this every kind of fish and poultry to be found, while *here* we have all but a famine; a fine roadstead too with good ships therein, but I found nothing whatever in the way of horticulture worth mentioning. The climate is much warmer than here, the valley being sandy—in fact no great time ago, the "shore of the sea." The heights are beautiful, totally covered with sugar-cane. I think of going and residing there a while as I found the climate delicious; very dry, and resembling *N. W. India in March and October.* I have waited in vain for the long promised Vanilla, but it is a *Creole promise,*—as I remarked before. A gentleman in the administration shewed me the curing of Vanilla

on a small scale in his garden and assisted me in getting the pamphlet on that subject. I send you my supplementary remarks thereon;—just now every body is smitten with the mania, as we of India with the tea, and this will soon bring down Vanilla mightily, it not being *quite* so much an article of general use as the latter. France is making Bourbon an important Depôt and Sanatarium for her China expedition, and in a month we shall have probably 3,000 Troops in the Island. Some of those huge transports have touched here *en route* to the seat of war: they landed a great number of ambulances, for the conveyance of the sick, who will arrive, without any exposure or exertion, to the mineral waters of Lalazie:—a system which we might follow with great advantage in India.

I send you a few seeds of the *Sapota(?)* a miserable fruit in *my* idea, but much devoured by the omnivorous inhabitants of Bourbon. The "*Coing de Chine*" is pretty to look at and quite as good as a date in flavour. The seeds of Mangosteen I found did not keep well, and I know you have not succeeded in Bengal with the imported plants: the Naga hills in Upper and Central Assam are the proper climate for this and all other Indo-Chinese fruits. I should prefer about Jeypoor, and Nowgong, where there is no frost, and Gowhatty or Goalparah for the delicate chocolate and vanilla plantations: plenty of heat, with shade and moisture, and no severe cold weather,—these are the necessary conditions of success for both products. I shall look out anxiously for all the seeds you can send me; I shall forward as soon as ripe, a large quantity of the famous "Lima Bean" known here as "*Pois du Cap*:" just now all the markets are crowded with this delicious vegetable, which only requires good cooking to render it very popular in India; as also may be said of the "Bourbon Palmiste," of which you will receive another sack of seeds. Glass cases are very dear here, nothing to be had under ten Rupees,

which is provoking for I wished to send you some of the naturalized rarities, and I have now so many friends among the ship Captains that I could have ensured their careful treatment. Not a duplicate catalogue of the Imperial Garden in all the Island, I tried hard among the administration to get one; this is odd, to say the least. It is possible I may leave for the Cape, directly the season opens, it is therefore as well to give you a list of plants you will do well to procure for India. Azalea, Camellia, double violets, roses, (*magnificent*), *Jessamine Franjipana*, (a lovely thing) Orchids, Palms, *Abutilon striatum*, (gives *no seeds*), many splendid flowering trees, shrubs, and plants of Madagascar,—especially the two *leathery textile Aloes:* avoocado pear, and fruit bearing trees of China &c., *Theobroma Cacao*, the various coffee plants and spice trees &c. &c. It is a pity that *Pandanus Vacoa** is not generally introduced into India, for it is exceedingly useful,—the cones are just now ripe, and you could get *maunds* of seed. The hedge Aloe of India here attains a gigantic size, just about 4 or 5 times that you have seen: it is a famous boundary to sugar-cane near high ways, and is much used as such. The leaves also are of great use in making small enclosures. I passed a cottage garden, where the palisades were very neatly constructed, as a temporary guard, of the leaves stuck into the ground and held firmly together by laths and string: it is impregnable to trespass.

I am keeping back my despatch solely for that long and oft promised gift of vanilla, and which I am very anxious you should see as a model of quality.

*August* 1*st*, *No Vanilla.*—I have accumulated for you a goodly store of rare palm seeds, they are all ready packed for despatch. M. Richard is ready to serve you to any

* A few particulars respecting this plant, and the mode of manufacturing bags from its leaves, will be found in the second vol. of the Journal, page 92.—*Eds.*

extent with his Madagascar rarities: he has at length managed to get me a *catalogue*, which he is now engaged in correcting and adding to. Several hundred plants and trees in his garden are not even yet *named*, never having flowered.

---

## *Result of trials for the culture of Exotic cotton in the Hyderabad Assigned Districts.*

*(Communicated by the Government of India.)*

*To the* SECRETARY TO THE AGRICULTURAL SOCIETY,
*Calcutta.*

Foreign Department. SIR,—I am directed by the Governor General in Council to forward, for the information of the Agricultural Society, the accompanying copy of a letter from the Resident at Hyderabad, dated 18th ultimo, No. 75, reporting the results of the trials made in the culture of Exotic cotton in the Hyderabad Assigned Districts.

C. U. AITCHISON,
*Under-Secy. to the Govt. of India.*

FORT WILLIAM:
*The* 13*th June*, 1860.

---

*To* CECIL BEADON, ESQ.,
*Secy. to the Govt. of India, Foreign Department. Fort William.*

Civil Department. SIR,—I have the honor to submit, for the information of the Government of India, a report of the trials made in the culture of Exotic cotton in the Hyderabad Assigned Districts since the date of my report No. 212 of the 18th November, 1857, on the subject.

2nd. I regret exceedingly that the experiments on Exotic cotton in these districts may be considered a failure up to the present time, but I shall direct that the trials be still proceeded with.

3rd. In regard to the cotton gin received from the Manchester Cotton Supply Association on which I had promised

to furnish the Government with a report in my report on the Administration of the Hyderabad Assigned Districts, for the year 1858-59, it is clear to me that the natives of India neither understand their adjustment nor how to use them, to which may be fairly attributed the want of success that has attended the experiments made with them.

4th. I now proceed to report on the several supplies of Exotic cotton seed received from the Government of India, or from other sources, during the period under review.

*Supply No.* 1.
Egyptian cotton seed received from Calcutta on the 26*th December*, 1857.

5th. On the 8th of July, 1857, the Government of India intimated to the Resident that the Secretary to the Bengal Chamber of Commerce had been requested to forward to Hyderabad 14 cases of Egyptian cotton seed, and directed that the seed should be fairly tried in this province and the result reported for the information of Government.

6th. This supply was received at Hyderabad on the 26th December, 1857, and despatched to the Deputy Commissioners in the Hyderabad Assigned Districts on the 4th January following.

*Supply No* 2.
Egyptian cotton seed and Brazilian cotton seed received from Calcutta, on the 9*th March*, 1859.

7th. On the 31st December, 1857, the Government of India advised the Resident that the Superintendent of Marine had been instructed to forward to Hyderabad 4½ bags of Egyptian and 1 of Brazilian cotton seed for experimental culture, and requested that a report of the result of the sowings of this supply also should be submitted for the information of Government.

8th. This supply did not reach Hyderabad till the 9th of March, 1859, and it was despatched to the districts on the 11th of the same month.

*Supply No.* 3.
New Orleans cotton seed received from Dharwar in *August*. 1858.

9th. In March 1858, at the suggestion of Captain Meadows Taylor, then Deputy Commissioner of West Berar, the Commissioner of the Hyderabad Assigned Districts

recommended to the Resident the purchase of 10,000 ℔s. of seed of the New Orleans cotton grown at Dharwar, which it was stated could be procured for Rupees 772-8-0 inclusive of carriage to Hyderabad. The Resident sanctioned the measure, but the seed was not received in the district till September, 1858, too late for a satisfactory experiment that season. A small quantity notwithstanding was distributed in West Berar to each Tehseeldar for trial.

10th. On the 16th June 1858, the Secretary to the Manchester Chamber of Commerce solicited the Resident's assistance in the extension of the cultivation of Exotic cotton in the Nizam's Territories, and the Hyderabad Assigned Districts, and promised to send some of the best New Orleans cotton seed, and the most approved gins for cleaning cotton, and requested to be informed what quantity of seed and number of gins would be required.

11th. The Resident expressed his willingness to further the views of the Manchester Cotton Association and asked to be supplied with 3,900℔s. of New Orleans cotton seed and 10 gins. He at the same time recommended that the seed should be sent, so as to reach Bombay by April, or early in May, with a view to its being distributed throughout the districts by the beginning of June.

*Supply No. 4.* New Orleans cotton seed, received from England in May, 1859.

12th. This supply of seed with 10 of "Macarthy's cotton gins," was despatched by the Manchester Cotton Association in November, 1858, and was received in the districts in May 1859.

Experiments with supply No. 1, in East Berar. Egyptian cotton seed.

13th. Of the supply No. 1, of Egyptian cotton seed, received from Calcutta and sent into the districts in January, 1858, the Officiating Deputy Commissioner of East Berar reports that a portion of the seed was tried in a garden at Nursee, but the plants, though irrigated, withered a few days after they had sprung up. That another small

quantity was tried by the Deputy Commissioner himself in his garden at Hingolee, but it likewise failed, only one or two seeds sprouted and then died off; other trials were also made, but as a general rule afforded no good result.

Experiments with supply No. 1, in West Berar. Egyptian cotton seed.

14th. The Report from West Berar of the sowings of the seed from this supply shows that the trials there also ended in a similar result.

Experiment with supply No. 1, in the Dharaseo district.

Egyptian cotton seed.

15th. The Deputy Commissioner of the Dharaseo district states, in regard to the experiment tried with this seed in his Division, that from the reports received by him from the Tehseeldars, the plant died when they were a few inches high, but that a trial made by himself in his garden was more successful. That about $\frac{3}{10}$ of an acre was sown, that probably from the seed being old it did not come up very regularly, but the bushes were healthy and attained a height of from 4 to 5 feet. The produce in cleaned cotton was 31 lbs. which gives about 100 lbs. to an acre. That the crop would have been larger had the plants come up regularly. The soil is stated to have been a deep rich one, thrown up by a river and was manured. Half the crop was watered several times, but there did not appear to be any material difference between the irrigated and unirrigated plants. The proportion of seed to cotton was about 2 to 1. The cotton plants were left in the ground and the produce in the year 1859, promised to be larger than that of the preceding year. Some of the seed grown in 1858, was sown at the commencement of the Monsoon in 1859, and in consequence of its being fresh, the whole of it germinated. The plants were about 2 feet high, and the crop promised to be a good one. The Deputy Commissioner promised a further report regarding the sowing of 1859, and forwarded a sample of the cotton grown in 1858, which sample is herewith submitted.

16th. The report from the Raichore Doab shows that the result of the sowings of this supply in that district has not been satisfactory.

Experiments with supply No. 1, in the Raichore Doab. Egyptian cotton seed

17th. In regard to the supply No. 2, of Egyptian and Brazilian cotton seed received from Calcutta and sent to the districts in March, 1859,—

Experiments with supply No. 2, in East Berar. Egyptian and Brazilian cotton seed.

The Deputy Commissioner of East Berar reports that the two descriptions of seed reached that district in good order about the commencement of the monsoon, that ground had been prepared in different localities, and of different descriptions, so that every precaution had been taken for ensuring the seed a fair trial on its arrival. He states that the result he has no doubt would have been more favorable had the seed reached the district a month earlier.

18th. The Monsoon rain he observes had set in early, and at first the season promised to be a favorable one, but the seed did not reach till after the first fall of rain. Long breaks in the Monsoon took place, and the crops from want of sufficient moisture did not attain their average size, the cotton generally being more than usually stunted.

19th. The Brazilian cotton seed, he reports, failed in a very unaccountable way. The plants sprang up well and looked very healthy, until they were about 6 inches high, when they became blighted and withered away.

20th. The Egyptian cotton seed has been more successful, but some plants in the same field having succeeded while others failed, leads to the impression that the seed was either not all of one season, or was not quite fresh.

21st. Some of the seed succeeded remarkably well, the plants being strong and healthy, nearly four feet high and bearing very large pods, and not having that degenerated appearance which the cotton had assumed in many places during the year.

22nd. Samples of cotton grown in East Berar have been forwarded by the Deputy Commissioner and are herewith transmitted.

23rd. Instructions have been issued by the Deputy Commissioner that the seed of the experimental cotton which has been tried in 1859, be carefully kept for further experiments during the coming Monsoon.

24th. From the experiments made last year in East Berar, the Deputy Commissioner thinks that were good fresh Egyptian cotton seed to be imported at the proper time, so as to reach the district about the end of April, much better results might be expected than have been above described.

25th. The cotton produced from the Egyptian seed appears to be of a superior quality to that grown from indigenous seed in Berar, but it would require more attention to its cultivation than the natives pay to the cultivation of the indigenous cotton.

Experiments with supply No. 2, in West Berar. Egyptian and Brazilian cotton seed.

26th. The report from the Deputy Commissioner West Berar shows that the results of the experiments tried in that district, with the Egyptian and Brazilian cotton seed, was an entire failure which is attributed by that Officer to the seed being old, and having lost its germinating properties in consequence.

Experiments with supply No. 2, in the Dharaseo district.

Egyptian and Brazilian cotton seed.

27th. The experiments in the Dharaseo district with the seed of this supply was likewise a failure.

Ditto No. 2, Raichore Doab.

Ditto ditto.

28th. No special report has been received from the Raichore Doab of the result of the sowings of the Brazilian cotton seed of this supply, but from a report by Captain Meadows Taylor, Deputy Commissioner of that district, it would appear, that the Egyptian cotton seed succeeded remarkably well, a good deal of valuable seed he states will be saved this year, (1860,)

and will be distributed for further trial. The cotton grown is fine in quality and the plant grows and bears well, with every prospect of improvement. The Egyptian cotton seed, Captian Taylor observes, grows better and is more productive than the New Orleans in the ordinary black soil; of 10 seers of cotton of this description produced in the Raichore Doab, the yield when gained was 2½ seers cotton and 7½ seers seed which is an average result.

29th. The following however taken from a report by Mr. Ricketts Assistant Commissioner in charge of the Raichore Doab of a subsequent date is not so satisfactory.

30th. He observes that such experiments as those reported by Captain Taylor, are not safe criterions to go by; that the yield in these isolated cases, where care, skill, and labor are expended is astonishing, not only in the case of exotic, but also of indigenous cotton, but these instances though they may stimulate the ryots to follow the example set them are perhaps useless in reporting on a staple product which is to be grown and sold by the ryots in their own way. Mr. Ricketts' report in fact shows that the results of the experiments in regard to the New Orleans cotton seed have been more unfavourable than those of the preceding year, and that the Egyptian and Sea Island cotton was almost a total failure, but this want of success is attributable chiefly to the want of rain in the Raichore Doab during the year 1859. In a further report received from Mr. Ricketts that officer states that the Egyptian and Brazilian cotton seed having been put down only experimentally, and in isolated parts of the district, no average statement of selling price can be given with any degree of certainty, that specimens grown in the cantonment of Lingsoogoor appear similar, even if not superior in fibre and staple to New Orleans, though the general color does not appear to be so good, as irrigation seems to discolor and blight a certain proportion of pods. The selling price however he

states may be calculated at from one anna and seven pies to an anna and eight pies per lb.

31st. Of the New Orleans cotton seed received from Dharwar for experimental culture in West Berar the Deputy Commissioner states that the seed sprang up in 7 or 8 days and appeared healthy, that in about three months the plants were in blossom, bore 3 or 4 pods each, and attained the height of about 2 feet, that after the first picking all the plants withered and dried, and that the average of cotton obtained per beegah was about 40 lbs.

Experiments with supply No. 3, in West Berar. New Orleans cotton seed from Dharwar.

32nd. The seed was tried in both the descriptions of soil in which the "Jerry" and "Bunny" (indigenous) sorts of cotton are grown in the district, and the seed, the Deputy Commissioner observes, may therefore be said to have had a fair trial, but notwithstanding, it is found, that the cotton produced per beegah is only equal to about one third of what is produced from the cotton seed, indigenous to Berar, which fact greatly tends to discourage the introduction of this new cotton into these districts. It is also the opinion of the ryots that the black soil of Berar is not well suited to the production of foreign cotton as the plants generally present a stunted and poor appearance.

33rd. The Deputy Commissioner states that the average price of the Dharwar cotton in West Berar is 2 annas and 6 pies per lb. which is the same as that for the descriptions of cotton indigenous to Berar. The Dharwar New Orleans cotton, it is admitted by all, is superior to that of Berar, but as the quantity produced in that district is small, no proper value is fixed on it. Samples of the New Orleans cotton grown in different soils in West Berar, and of the indigenous cotton have been forwarded by the Deputy Commissioner, and are herewith submitted.

Experiments with supply No. 4, in East Berar.

34th. The report from East Berar shows that the New Orleans cotton seed

New Orleans cotton seed from Manchester.

received from the Manchester Cotton Supply Association did not germinate in that district.

35th. The West Berar report exhibits a similar result with this supply of seed.

Ditto, Ditto, West Berar.

Ditto, ditto.

Ditto, ditto, Dharaseo district.

36th. The Deputy Commissioner Dharaseo district reports that the New Orleans cotton seed received from Manchester has entirely failed in that division. He states that he had a part of a garden at Nuldroog sown with it, but a small number only of the seeds germinated. The plants that did come up were stunted, and a very small quantity of cotton was produced. It seems clear, he states, that the seed was old, and when endeavouring to introduce a new species of cotton it is of the greatest importance that the seed should be good, for if it is not, it will be difficult to induce the ryots to expend their labor on it a second time. The Deputy Commissioner promises to forward a specimen of the cotton from this growth.

37th. The report from the Raichore Doab shows that none of the New Orleans cotton seed received from Manchester vegetated in that district. The Deputy Commissioner however states that the average selling price of New Orleans cotton in the Raichore Doab grown from seed produced by the ryots from Dharwar is about 5 Rupees per candy above the selling price of indigenous cotton. More extended sowings of exotic cotton will be made this year in the Government gardens and by Tehseeldars, so as to retain the interest in the matter and keep in hand a good supply of seed.

Experiments with supply No. 4, in the Raichore Doab. New Orleans cotton seed from *Manchester*.

38th. Of the ten cotton gins recieved from Manchester 3 were furnished to each of the districts of East and West Berar, and 2 to each of the divisions of the Raichore Doab and Dharaseo.

"Macarthy's cotton gins," received from the Manchester Cotton Supply Association.

39th. The Deputy Commissioner of East Berar reports, that it was some time before the gins could be properly adjusted and when put into working order and tried, the results were by no means satisfactory. The gin he observes frequently gets jammed, and all who have seen the cotton which has passed through the gin state that the staple has been torn and spoiled, and the opinion of all the natives who saw it was, that if they had their cotton passed through that gin it would not fetch nearly so much in the market as when prepared by the native churka now in use.

East Berar.

40th. The Deputy Commissioner West Berar states that in consequence of the injuries to the gins in transit to the district they are out of order and no artisans are to be found there who are capable of rendering them serviceable, but that as the Railway Engineers are shortly expected to arrive there, he hopes to have them put in working order and promises a report after they have been tried.

West Berar.

41st. Of the results of the trial of the cotton gins in the Dharaseo district, no report has been received.

Dharaseo district.

42nd. The gins in the Raichore Doab would appear to be working satisfactorily as the Deputy Commissioner states that the two received by him from Manchester are not equal to the wants of the district and recommends that the number should be increased.

Raichore Doab.

43rd. I would here beg to take this opportunity of submitting the results of a trial made by Captain Meadows Taylor, in the Shorapoor district in 1859, of New Orleans cotton seed obtained by him from Dharwar.

44th. Captain Taylor states that with this cotton he has tried a different soil and a different period of sowing than obtains in Dharwar, and it appears to him that the yield is more satisfactory and the staple better and softer. In

Dharwar this cotton is grown upon black soil exclusively, and sown in September. Captain Taylor's trial of the seed in this instance was in very ordinary red granite soil of a sandy quality unmanured and unirrigated, and was sown in June. The fall of rain he observes at Shorapoor was unusually scanty yet the plants were healthy and bore freely.

45th. The cotton was gathered as it ripened and was cleared from the seed by a common native churka. It has not been specially cleared or picked.

46th. It will, he states, be of great importance to the ryots in the Shorapoor districts if it is found that the New Orleans cotton grows and bears well on red soil in which the indigenous cotton does not answer at all. In the present instance the sowings were of very limited extent, but he has no doubt that they can be very widely spread if the result continues as it now promises.

47th. Captain Taylor forwarded a sample of this cotton to Messrs. Robert Strong and Co. of Bombay for transmission to the Manchester Cotton Supply Association, on which the following opinion was given by them.

"The sample arrived this morning and has been exa-"mined by two other parties of experience in the cotton "trade as well as by ourselves, and the conclusion come "to is, that this sample is all that could be desired by those "interested in promoting the cultivation of good cotton "in this country, and it is believed that any quantity of "this quality would find a ready sale in Liverpool at "the full rates for fair Orleans, at present 7¾*d.* to 8*d.* "per lb. We have never had an opportunity of compar-"ing this sample with cotton grown in black soil, but are "inclined to believe that the mode of culture adopted by "you is peculiarly suited to this description of seed, no "sample of New Orleans growth in this country having "been seen here to equal yours. We may add that one "of the parties above referred to is the Secretary to the

"Chamber of Commerce, who has been paying great attention to the results of the cultivation of exotic cotton. "It was remarked in reference to the clearing of your "sample that the churka had been very successful, whereas Dr. Forbes reports the churka to be entirely useless "for cleaning American seed cotton. We mention this "that you may observe if there is any greater difficulty "in extracting the seed by this machine from this class of "cotton than from the indigenous varieties."

48th. In forwarding the above opinion Captain Taylor adds, that as far as this goes, this is the most satisfactory experiment he has yet made in exotic cotton, and that he will do his best to extend the cultivation next year in red or mussub soil, which he is strongly inclined to think is much more favorable to the culture of the New Orleans variety than black soil.

49th. The seed however he remarks should be sown in June, and if early sowing is carefully attended to, the plant begins to bear at the latter end of October and continues to do so as long as February and March.

50th. The sowing he states in Shorapoor in 1859, is hardly a fair trial, the soil of the plot of ground being very poor and not manured or ploughed, but under the encouragement afforded by the trial better land will be selected next season with, he trusts, more certain effect both as to quality and quantity.

51st. He forwards a sample of this cotton being a duplicate of that sent to Messrs. Robert Strong and Co.

Samples will be forwarded to Commissariat Agent at Masulipatam for transmission to your office in Calcutta.

52nd. I beg to append a list of the samples of cotton received from the district Officers and referred to in this Report.

I have the honor to be, &c.,

HYDERABAD RESIDENCY : (Signed,) CUTHBERT DAVIDSON,
18*th May*, 1860. *Resident.*

*List of samples of cotton grown in the Hyderabad Assigned Districts, and in the Shorapoor Territory forwarded with Despatch No. 75, dated 18th May, 1860, to the Secretary to the Govt. of India Foreign Department Fort William.*

*Samples from East Berar.*

No. 1, A.—A specimen of the Egyptian cotton in first class garden land but not irrigated. The plants grew of two heights three feet and two feet, the pods were 1½ times larger in size than that of the country cotton but were fewer in number than the pods of the country cotton plants, this is accounted for by the seed having reached a month late and the plants not having attained their full size in consequence. The plants which grew three feet high, had from 15 to 22 pods each, the two feet plants only had from 8 to 10. The experimental cotton produced on an average 10 or 12 pods less than the native cotton in the same locality. The smaller quantity of pods may be well accounted for by the seed arriving rather late, and the two descriptions of plants would seem to show that the seed was mixed.

No. 2, A.—A specimen of Egyptian cotton from 1st class black soil. The field in which this was tried was one half manured, and one half left without manure. In the manured portion the cotton grew three feet high, and in the other portion two feet. The pods of the large plants were as in the former case 1½ times larger than the country pods, and each plant had from 15 to 20 pods, the smaller plants became blighted, and have only 8 or 10 small pods each, the large plants produced about 10 pods fewer than the native cotton under similar circumstances.

The reports which accompanied the specimen from the district shows that the seed did not come up regularly, in many places not at all; of seven or eight villages in which it was tried, it succeeded in one only and there very partially.

No. 3, A.—A specimen grown in second class black soil. The plants obtained the height of two and three feet, the plants have on the average the same number of pods, as the native cotton grown in similar situation, but the report states that the plant had a dried up appearance, the large plants had from five to fifteen, and the smaller from three to ten pods, but the pods were 1½ times larger than those of the country cotton. In one instance only an eighth part of the seed sown succeeded, the rest failed entirely, while in another the plants came up well, but when the pods filled, half of them fell off the plant.

No. 4, A.—Is a specimen of the cotton of the country known as Jerry, the pods are heavier than those of the other country cotton known as Bunny, and the cotton is rather whiter and fetches a little higher price in the market.

No. 5, A.—A specimen of the country cotton known as bunny and which is the sort most cultivated in the south of the district, the seed is sown in the commencement of the rains and the crop is ready in the month of November.

Another point which may be worthy of notice is that the bunny cotton produces a great quantity of seed to a very small quantity of cotton, on weighing a quantity of this description previous to, and after it had been separated from the seed, it was found that the seed weighed three times as much as the cotton, or that four pounds weight of cotton taken from the plant produced three pounds of seed and one pound of cotton.

The same experiment was tried with jerry cotton and with the Egyptian cotton and it was found that three pounds taken from the plant produced on an average about two pounds of seed and one pound of cotton.

*Samples from West Berar.*

No. 1, B.—Cotton produced at Akote from New Orleans cotton seed received from Dharwar.

No. 2, B.—Cotton produced at Dawulghaut from ditto.

No. 3, B.—Bunny cotton grown at Dawulghaut.

No. 4, B.—Jerry cotton grown at Akote.

*Sample from Dharaseo District.*

No. 1, C.—Egyptian cotton.

*Samples from Raichore Doab.*

No. 1, D.—Indigenous cotton.

No. 2, D.—New Orleans.

*Shorapoor.*

No. 1, E.—New Orleans cotton grown in red granite soil.

---

*To the* SECRETARY TO THE AGRICULTURAL SOCIETY.

*Calcutta.*

For. Department.

SIR,—In continuation of my letter dated 13th ultimo, No. 1,909, I am directed to transmit, for the information of the Agricultural Society, the enclosed copy of a further communication from the Resident at Hyderabad, dated 1st idem, No. 84, together with specimens of the cotton therein alluded to; and to request that the Society will favor Government with their opinion as to the quality of the cotton.

C. U. AITCHISON.

*Under-Secy. to the Govt. of India.*

FORT WILLIAM:
*The 7th July,* 1860.

---

*To* C. BEADON, ESQ.,

*Secy. to the Govt. of India, Foreign Department.*

*Fort William.*

Civil Department.

SIR,—With reference to para. 36 of my letter No. 75, dated the 18th May, 1860, reporting upon the trials made in the culture of Exotic cotton in the Hyderabad Assigned Districts, I have the honor to intimate the despatch* to your address of a parcel containing specimens of cotton grown

* By Banghy Dâk.

in the Dharaseo district from the Deputy Commissioner of that division.

2nd.—Sample No. 1, is from Egyptian cotton seed mentioned in my report as supply No. 1, received from your Department in December, 1857, and sent to the districts in January, 1858, and the crop has been two years in the ground.

Sample No. 2, is from seed obtained from the above crop last year.

Sample No. 3, is from the New Orleans cotton seed received from the Manchester Cotton Association in May, 1859, mentioned in my Report, as supply No. 4.

3rd.—The proportion of cleaned cotton, to seed, the Deputy Commissioner reports is as follows :—

| | | |
|---|---|---|
| No. 1 .. .. | 1 .. .. .. | 10-11 |
| No. 2 .. .. | 2 .. .. .. | 1-21 |
| No. 3 .. .. | 1 .. .. .. | 17-23 |

and the produce per acre of cleaned cotton.

| | | |
|---|---|---|
| No. 1 .. .. | 107 lbs. .. .. .. | 11 oz. |
| No. 2 .. .. | 44 lbs. .. .. .. | 13 oz. |
| No. 3 .. .. | 26 lbs. .. .. .. | „ |

I have the honor to be, &c.,

(Signed,) C. DAVIDSON,

HYDERABAD RESIDENCY : *Resident.*

1*st June*, 1860.

---

*To the* MEMBERS OF THE COTTON COMMITTEE.

GENTLEMEN,—By direction of the Society I beg to circulate, for the favor of your opinion thereon, 3 samples of cotton as detailed below, raised in the Dharaseo district, (Hyderabad Assigned Districts) and forwarded by the Resident of Hyderabad.

I also place, in the box, reports from the Resident of Hyderabad, on the results of trials made in the culture of

exotic cotton in the Assigned Districts communicated to the Society by the Government of India.

I am, &c.,

METCALFE-HALL: A. H. BLECHYNDEN,
*21st July,* 1860. *Secretary.*

*No.* 1.—*Raised from Egyptian seed.*

*No.* 2.—*Raised from acclimated Egyptain seed.*

*No.* 3.—*Raised from New Orleans seed.*

*Report on the above samples by a section of the Cotton Committee of the A. & H. Society of India.*

*No.* 1.—*Raised from Egyptian seed.*—This as well as the following is mixed with a peculiar fibre more like wool than as cotton possibly belonging to some other plant, to such an extent that any valuation in their present state is out of the question.

The cotton itself is very superior to New Orleans, long, soft and silky staple, color injured by being plucked in wet weather. It is a most valuable article and if free from adulteration, would fetch as much or more than the best Egyptian.

*No.* 2.—*Raised from acclimated Egyptian seed.*—Also most valuable cotton though much mixed, badly ginned and carelessly gathered.

*No.* 3.—*Raised from New Orleans seed.*—Good useful cotton equal to "ordinary" New Orleans and worth 5*d.* to 5½*d.* ℔ on the 2nd July. It is a description much wanted in Manchester.

H. A. HURST.

*No.* 1.—*Raised from Egyptian seed.*—Not cleaned properly, color indifferent, fibre long.

*No.* 2.—*Raised from acclimated Egyptian seed.*—Not properly cleaned, long fibre, color same, No. 1.

*No.* 3.—*Raised from New Orleans seed.*—Not properly cleaned, fibre long.

C. A. CANTOR.

*Correspondence respecting the Box-wood of the Himalayas, with a report on its quality. Award of the Society's prize of Rs.* 500 *and gold medal.*

In December 1858, the following report was laid before the Council of the Society from Mr. Whitley, Wood Engraver to the School of Industrial Arts, Calcutta, on certain specimens* of Himalayan box and other woods, which were submitted to compete for the Society's prize of Rs. 500 and a gold medal "to the discoverer of any wood "indigenous in India, and procurable in sufficient quantity, "which shall serve as an efficient substitute for Turkish "box, especially for wood engraving:"—

H. Scott Smith, Esq.,

*Honry. Secy. School of Industrial Art.*

Sir,—Having made an examination of the specimens of wood sent, the following is the result.

2. In the first place there is but one sample that approaches the excellence of Box-wood, it is the wild pear No. 8 in Lieut. Pogson's list. I find it quite as good as Box-wood as far as regards the fineness of its structure and the

* *List of samples of Wood.*

10 samples from Simla, forwarded by Lieut. J. F. Pogson, viz. :—

No. 1. Hill Box (conic section.)
,, 2. (Two samples) *Cupressus Torulosa.*
,, 3. *Picea Pindrow* (of Royle.)
,, 4. Hill Ash.
,, 5. Holly.
,, 6. *Arbutus.*
,, 7. Hill yew from Baltee.
,, 8. Wild Pear.
,, 9. Hill Box from Rutna Forest.

2 samples of Himalayan Box, forwarded by Mr. George Jephson.
2 ,, from Beerbhoom, forwarded by Mr. O. W. Malet, viz :—log of the "Papur" (*Gardenia latifolia.*) and Log of the "Chukultah" (*Nauclea cordifolia.*)
2 ,, from the Punjaub, forwarded by Mr. H. Cope, viz :—Wild olive of the Punjaub and Himalayan Box

clearness of the cut made by the graver. There is however one draw-back that would be fatal to its pretensions as a rival to Box-wood, that is its colour, no engraver would like engraving on a dark ground. Our work is bad enough for the eye sight, but with a dark ground matters would be worse, nevertheless if it could be sold at a cheaper rate, it might be used for some of the purposes for which we now use Box-wood. There is another consideration, does the wild pear crack to any extent in seasoning.

3. The sample upon which I report is of the size of the accompanying sketch and is a section from a longitudinal slice. For the purposes of wood engraving we use *transverse* sections only of the log, and it would be better that all samples of wood sent, should be such, or logs from which we could cut them. If a longitudinal slice be sent it only affords a small piece by which to test the wood and in consequence it is not possible to make so perfect an examination as can be made from a transverse section.

2 logs of Box from the Punjaub, forwarded by Capt. W. Hay.*

1 sample called "Hurdooa" from Jubbulpore, forwarded by Mr. J. B. Williams.

* *Extract of a letter from Capt.* W. G. HAY, *to* DR. T. THOMSON, *Camp in Kooloo, district of Kangra,* 18*th November,* 1856.

"I have also collected about 100* remarkably fine logs of Box-wood the largest I have ever seen: these I am anxious should appear in competition for the 500 Rs. and gold medal offered for the best substitute for Turkey Box. Now I am a long way from Calcutta and without any friend there could scarcely hope that my wood would have any fair chance. What I wish to ask you, is whether you would allow me to send this wood to you, and whenever the exhibition takes place, whether you would have this wood produced and done justice to. Of course I would send a careful man with it to Calcutta, and if you would have it stored until the exhibition takes place, I would pay any godown hire. All I want is a fair chance. The wood is very good. The tree generally gets one crack in it soon after being cut, and does not split afterwards: it is a splendid wood for printing purposes, for turning, or for making mathematical instruments, or carpenter's tools. I have about 300 logs, but I should suppose that 100 would be quite enough to exhibit. After it has been produced I should wish it sold by auction if the rules admit of this, in order that I may be re-imbursed for my outlay. I propose to send it to Roorkee, by land and from thence to Calcutta by water, and if you will permit me, send it to your care. * * * * * I dont think such specimens of Box will have been produced before, and it is abundant, and 100 logs, some of them weighing nearly a maund each, will give a very fair sample."

* Capt. Hay, on further consideration, sent only 10 logs.

4. There are two samples, the holly No. 5, and the *Arbutus* No. 6 of Lieut. Pogson's list that might prove useful for colour printing for book illustrations and other purposes; so likewise in an inferior degree might the *Picea Pindrow* No. 3, and the *Cupressus Torulosa* No. 2, of Lieut. Pogson's list.

5. The wild olive (Mr. Cope's) I consider objectionable for engraving purposes on account of its dark colour and coarseness of porous structure, and also that cutting it with the graver it has a peculiar roughness as though the wood contained a considerable amount of oil, which I presume is the case. It is heavier than Box-wood usually is and as hard as that wood, but this latter qualification I regard as a draw back for colour blocks because of the labour of cutting them.

6. The Hurdooa of Mr. Williams might prove useful for the latter purpose, but to judge from the specimen sent, it cracks to too great an extent to be of any use. Excepting the Box-wood, which I have not yet noticed, there are no other specimens that I think necessary to comment upon further than to say that they are unfit for wood engraving and also are unfit for colour blocks.

7. I would observe that I am not very well informed as to the requirements of colour printing either for books or otherwise. Metal plates may usually be preferred to wood for aught I know, or if wood be desired it may be obtainable nearer England or actually growing on the soil. Still it might be as well trial should be made of those of Lieut. Pogson's. I have mentioned especially if the trees be of large size and the wood does not crack too much in seasoning. There were some specimens of Burmese wood I examined some months back that might with advantage be put to similar proof. Should the Committee or the Horticultural Society desire it they could send a log of each specimen to two London houses, Mr. Leighton of Red Lion

Square, Holborn, and Mr. Evans of 4 Ragnet Court, Fleet Street, who both print in colours from blocks for book illustration. As regards paper hanging printing or calico printing I do not know any addresses to give you and am very ignorant of the subject.

8. The Boxwood sent I judge to be equal to that procured from the Levant. The Boxwood used in England differs in quality, some is rejected altogether for engraving on, some though used for engraving is yet inferior, while some is of excellent quality. Of course from the few samples sent it is impossible for any one to say whether the average quality is inferior, equal, or superior to that received in England, but from the specimens I presume much about the same.

9. The Boxwood from the Punjab (Captain Hay's) is deserving of especial mention on account of its large size, perhaps it grows as large in other parts of India, it is not however larger than much we receive in England. No. 1, is very good, both in colour and quality, No 2, is a little dark; a defect that sometimes exists in the Boxwood we import.

10. Except for the purposes of wood for the pupil's practice, I think it would at first be more worth while to import prepared Boxwood from England than to receive the logs from up-country and cut them up here. Judging from the experience gained by getting the slices prepared from the specimens sent, one of two things would probably be the case. If you employ a first rate native or China carpenter the expense, coupled with that of obtaining the wood, will be greater than would cover all expenses of importation and cost price of material in getting it ready prepared from England. If you employ a common carpenter you run the risk of spoiling an engraving for the sake of a few pice or annas as the case may be. Coupled to all this is the risk of the wood not being properly seasoned for engraving on. It would be a sad thing if after having

finished an engraving worth 20, 50, or 100 Rs. &c., the block should begin to twist or crack. Better that the trifling cost of material from England should be paid many times over than that such risk should be run. Our Box-wood carpenters see to all this in England, an engraver knows but little about it and until knowledge or experience had been gained, the safe side must be kept.

11. May I have such logs as are useful cut up for the pupil's practice? they would be a gain to us and very acceptable. Please let me know.

Yours, obediently,

SCHOOL OF INDUSTRIAL ART. (Signed,) GEORGE WHITLEY.

*12th August*, 1858.

---

It being considered desirable to ascertain from Mr. Whitley whether, in his opinion, the specimens of box sent by Messrs. Cope, Jephson, and Pogson would be equally as well adapted for wood engraving as Capt. Hay's specimen, provided as large logs were sent, a letter was addressed him on the subject, to which he sent the following reply :—

*To* H. SCOTT SMITH, ESQ.,

*Hony. Secretary Industrial Art Society.*

SIR,—I have received the letter from the Secretary to the Agri-Horticultural Society, and in pursuance to your request, beg to forward the following report upon the specimens sent.

2. The specimens of Boxwood were sent by four gentlemen, namely one by Mr. Cope, two by Lieut. Pogson, two by Mr. Jephson, and two by Capt. Hay. Mr. Cope's specimen does not cut very clearly, possibly owing to imperfect seasoning and preparation. Lieut. Pogson's specimens are merely parts of slices, and as sometimes one part of a slice is good and another bad, it is hardly possible to make a fair report upon them. They are pretty good in quality with the exception of the piece marked *Hill Box* which is not regular in its grain. The specimens of Mr. Jephson are

not also regular in grain. Of these, No. 2 is of inferior quality, while No. 1 is good, and one or two square inches of it is as good as it is possible to get. It is therefore an exception to the rule that when the grain is contorted, the wood is inferior. Capt. Hay's specimens are not very close in their grain, but there is very good wood with open grain.

3. The very best Box-wood is that which is heavy, of straw color, and close and regular in grain, but none of the specimens sent, strictly speaking, possess these qualities, although the same may be said of the wood we use.

4. Speaking of the quality of the specimens, two or three of the competitors go so near to each other, that it is impossible to settle the question of superiority; but upon the whole, Capt. Hay is justly entitled to it, and if the size be taken into consideration, the balance is still more in his favor, although I cannot say the size of the logs from which Lieut. Pogson's pieces were cut.

5. If the Committee of the Society like to ascertain whether the other competitors could not send as good and as large or better and larger wood, I will recommend that each of the four gentlemen be requested to send *transverse* sections of the best and largest logs they can find, observing at the same time the signs of quality above alluded to, viz. as regards weight, color, denseness and regularity of grain. I would recommend each sending slices rather than logs, as it gives a better chance of proper seasoning for engraving purposes; and the slices to be taken from different trees, for while one log is indifferent, another, a few yards or quarter of a mile off, might be of excellent quality. It is also to be particularly told to them, to cut the slices at right angles to the direction of the grain thus, in the figure, if the direction of the grain be from A to B, the slices be cut from C to D.

I remain Sir,

CALCUTTA:
*5th February*, 1859.

Your most obt. servant.
(Signed,) GEO. WHITLEY.

It was agreed, on receipt of the foregoing letter, that a copy be sent to each of the above named gentlemen, and that if disposed to act on the suggestion contained therein, they be requested to send half a dozen slices from as many different logs; stating also the value of the logs in their respective districts, giving the length and diameter of those from which the specimens were taken; and furnishing likewise an estimate of the number of logs they could procure per annum, with an estimate of the expense of sending them down to Calcutta.

To this requisition Mr. Jephson has responded as the following communications will show :—

*To* A. H. BLECHYNDEN, ESQ.,

*Secretary to the Agri-Horticultural Society,*

*Calcutta.*

DEAR SIR,—Want of my usual health has prevented due attention to your letter of the 25*th* of April last, enclosing one from Mr. Whitley regarding the samples of Himalayan Box-wood sent to you in 1857. But I have not been altogether unmindful of the wish expressed in Mr. Whitley's letter for further samples, and information as to the supply obtainable. I have accordingly journeyed from time to time, as I could find leisure, to such localities as contained trees worth looking at, purchasing a few, for every tree in these mountains has its owner and its value, even fuel cannot be cut without payment to the petty Chieftains.

I shall have the pleasure of sending you, early next month, a few specimens cut, as directed by Mr. Whitley, and varying from 4 to 12 inches in diameter. I have let the trees stand up to this time, to allow as much sap to descend as possible, from the commencement of our cold, dry weather, and I must go out myself to superintend the felling and cutting into logs, or much of the wood would be chopped away and wasted by the men employed.

It would not be an easy matter to give an exact estimate of the cost of logs, nor the number that could be supplied annually. No trees are to be found nearer to Simlah than 10 miles. Many are twice and thrice that distance, and the finest 60 to 80 miles. I shall perhaps be able to speak as to average cost and supply after I have cut and brought in what I have purchased.

The trees nearest to Simlah usually grow scattered in patches of 5 to 20, my largest is a lonely specimen, 10 miles away from any other. About hundred trees of 4 to 12 inches diameter (not many of the latter) could be obtained within a radius of 36 miles from Simlah. Beyond that distance my search has not extended, but one of my hill-servants from a distant quarter, informs me that in his neighbourhood some trees are obtainable larger than what I have seen, and I know from books and travellers, that trees are to be found scattered over the mountains between Nepaul and Cashmere. But as many of our travellers, and many of the mountaineers do not know the tree, it is possible that it may be found in larger numbers than I have been led to expect in those ranges. In this neighbourhood it is known, because the comb makers of the Punjab resort to Simlah to buy small logs from the hill-men, of 3 to 4 inches in diameter.

I am, &c.

SIMLAH : GEO. JEPHSON.

19*th October* 1859.

---

DEAR SIR,—I wrote to you about the middle of October, regarding box wood, since which I have travelled a considerable distance to enable me to judge for myself as to the supply of which my hill servant spoke.

I have now the pleasure to advise you, of the despatch to day, to your address, of a box containing 10 specimens of box wood, measuring as follows:—

1 of 9 Inches diameter.
1 „ 10 × 8 „
1 „ 7 × 7¾ „
1 „ 11 × 8 „
1 „ 8 × 7 „
1 „ 11 × 6 × 3 „
1 „ 7 × 6½ „
1 „ 8½ × 4 „
2 „ 4 × 2½ each.

Each section or cutting is 1¼ inch thick to admit of shrinking and dressing down to 1 inch, the thickness, I believe, of blocks for wood engraving. I could send sections of less diameter than the large pieces, and good clean hard wood, but have thought it best to forward the largest I have. The two 4 inch pieces are sent for curiosity sake, being cut from a root. I have not heard of the root being used for wood engraving or any other purpose, but those which will reach you promise to turn out as well as sections from the stem. Some of the larger pieces have split for a couple of inches owing to imperfect seasoning, and having been put in the sun by the carpenter employed in dressing them. I could send others instead, but am averse to cutting off any more, as the logs are now in process of seasoning.

I have every reason to believe that the specimens sent, and the supply I have on hand, are equal to the wood from the Levant, as they answer perfectly to Mr. Whitley's description of "the very best box wood," being "heavy, of straw color, and close and regular in grain." The logs now seasoning, 14 in number, are from 2 to 6 feet in length, 3 to 9 inches in diameter, straight, and suitable for musical and mathematical instrument makers, as well as for wood engraving.

Will you oblige me by making over to the Secretary or wood engraver of the Industrial School in Calcutta, one large and one root specimen for report, retaining a large specimen for Dr. Hunter, Secy. to the Industrial School at Madras, to whom I have written about it, and one large for your museum, the remaining 6 to be forwarded to Mr. Whitley.

I shall write again in a few days about the cost and supply of Himalayan Box-wood.

I am, &c.

SIMLA: GEORGE JEPHSON.

1*st December*, 1859.

---

DEAR SIR,—In your communication of the 25*th* April last, relative to Himalayan Box-wood, you required the following information:—

1. The value of Box-wood logs in this district?

2. The length and diameter of logs from which specimens have been sent?

3. The number of logs procurable per annum?

4. Cost of transit to Calcutta?

I proceed to answer these questions in the order they stand, and regret having been unable to do so earlier; indifferent health having prevented me from travelling in this rugged country until lately, which it was necessary to do, native information not being always to be depended upon, and the inhabitants of many districts in the mountains totally ignorant of all but the commonest trees.

1. "*Value of Box-wood logs in this district?*"—The value of a log of any wood will, of course, depend upon the cost of the tree, the size and weight of the log, and the distance it has to be carried into Simlah, where wheeled carriage to the plains is available. It is impossible to state exactly the cost of trees; it will depend upon their size, and the idea the petty Chiefs, who are the owners, may

entertain of their value; but I will endeavour to convey some idea on this point. The tree from which my largest specimens have been cut cost seven rupees, besides a present of some coarse gunpowder to the Rana. It grew at a distance of 17 miles from Simlah, and yielded only four logs of good diameter, the butt being unsound for several feet, except on one side, by which the vitality of the tree was maintained. The carriage of a log measuring 3 feet 10, diameter 9 inches tapering to 7, was 10 (ten) annas; it weighed 47 seers, and was therefore a load for two men, the maximum weight for a porter or cooly in this part of the mountains having, absurdly enough, been fixed at 25 seers, and the hire at 4 annas per day for stages not exceeding 12 miles. I mentioned in my letter of October, that few large trees were to be found within easy distances of Simlah; none of large diameter grow lower down, and calculating from the furthest point at which I have found them, the log described would cost in carriage only to Simlah, 4 Rupees; less, of course, from localities not so far off.

2. "*Length and diameter of logs from which the specimens have been taken?*" The diameters are stated in my letter of the 1st instant; the logs taper slightly, and are of different lengths, from 3 feet 10 to 5 feet. I have other logs from which specimens have not been sent, as the diameters do not exceed what can be obtained in England from European ports, viz., one of 6 feet, 6 and 5 inches diameter; one of 3 feet 3, 5½ and 5 inches; one of 6½ feet, 5 and 4; one of 5 feet 5, 4 and 3; one of 3 feet, 3½ and 3; one of 6 feet, 3 and 2⅞; and one of 2 feet 10, 3 inches at both ends: I have also a log of 3½ feet that would have given a section of 12 inches, but it is unfortunately decayed at heart.

3. "*Number of logs procurable per annum?*" About 100 logs of 3 feet, and *not under* 6 inches diameter, could be

supplied annually from hence, for three or four years, after which the supply from this part of the Himalayas must cease for a long time, until the young trees of 2½ to 3½ diameter have attained something of a good size. Many of these exist, but all hard wood trees are of slow growth, and box particularly so. According to Royle the tree only attains a diameter of 1½ to 2 inches in 20 to 25 years, a tree of 8 inches would therefore be 100 years old.

4. "*Cost of transit to Calcutta?*" A log weighing one maund would cost by bullock train 6 Rupees, viz. 1/8 from Simla to Umballa by the "Hill Train," and 4/8 thence to Calcutta by the "Commercial Train," those are the present advertised rates; and one ton (27¼ maunds) would therefore cost Rupees 133-8-0, but by common carts not more than half that sum, or about £6-15-0. Taking one locality with another in these ranges, a ton of boxwood could not be laid down in Simla under the equivalent to £6; for it must be remembered that only the lower or largest portions of the trunk would have a chance of competing with the Box-wood of the Levant, rating no higher than £11 to 12 for prime logs; all the remainder of a tree, under 6 inches, would be next to useless, except the small quantity required by the schools of Industry at Calcutta and Madras. I fear indeed that logs of 14 and 15 inches in diameter, of which I could obtain some, would not be remunerative, the cost of transport, as with other Himlayan products, shutting it out of the market.

This has grown into a long letter, but I wished that the information asked for, should be as full and complete as I could give it. I have been at some trouble and expense to obtain it, for travelling in these mountains is neither cheap nor easy. I will not close, however, without mentioning that Himalayan box is a different variety from the *Buxus sempervirens* and *B. balearica*, known and used in Europe for wood engraving and other purposes, and is now

recognized as *B. emarginatus* by Dr. Royle. This difference ought, I submit, in addition to the size and quality of my specimens, as well as the information conveyed herein, to have some weight in deciding the question of the premium in my favor. It may be said that I am not the discoverer of the wood. I would not assert so much, but I may safely refer to Mr. Stanley, of the firm of Dykes and Co. Calcutta, as to my knowledge of the wood 20 years ago, (anterior to the publication of Royle's work) when he saw in my possession a small specimen of Himalayan Box-wood, which was planed in his workshop, and on which he pronounced a favorable opinion. I have been acquainted with the tree in these mountains since I first visited them in 1828, and saw the wood cut into combs by Punjabee and Hindoostanee comb makers, who still resort here for supplies of small wood.

I am, &c.,

SIMLA: GEORGE JEPHSON.

*18th December*, 1859.

---

DEAR SIR,—It may be as well to mention, separately from my report on the supply of Box-wood hereabouts, which is perhaps likely to appear in print, that when I paid for, felled, and sent into Simla, the large logs referred to in the accompanying letter, I had for a travelling companion Mr. F. Simms, an Engineer of the E. I. Railway, who will vouch, if needs be, for the outlay incurred, as well as the toil and fatigue encountered in a further journey of eight days, to visit a locality containing box trees, of which information had been brought by my hill servant. The last five days of the journey we had to travel on foot, as neither ponies nor any other hill conveyance could be used on the steep and narrow paths it was necessary to traverse. In visiting the locality alluded to, I found one remarkable tree, growing out of a fissure in a rock, the butt of which would give a section of 16 to 18 inches,

according to inequalities in the tree. The butt, however, is not more than two feet high, it then shoots into four stems, of 4 to 5 inches diameter, but not exceeding 15 and 16 feet above the parent stem in height. The wood of this singular tree ought to be very hard, as the root must be scantily supplied with moisture. Small as the yield would be in blocks, the butt might be considered worth having by some engravers at home, as of late years it has been found difficult to obtain good Box-wood of 10 to 12 inches from the Levant.

I ought to have informed you, in my letter of the 1st instant, that with the specimens you will find a section or half section of mountain holly, one amongst many kinds of wood on which I have experimented. It is marked *holly*, and was put in to help in filling up the packing case, and, if thought worth while, to find a place amongst the collection of woods in your Museum. Holly is used at home, dyed, and empolyed for the stringings or inlaid lines of cabinet work, and for squares of chess or draft-boards, it is well adapted for the blocks used by Calico printers, and is the only wood used for what is known as Tunbridge ware. It might therefore be worth notice in the School of Industry.

I remain, &c.,

SIMLA: GEORGE JEPHSON.

18*th December*, 1859.

---

The report of the Special Committee of the Council in respect to the above communications was submitted and adopted at a General Meeting of the Society held in June 1860. The Committee, after full consideration, agreed to recommend that the prize of 500 rupees and the gold medal be awarded to Capt. Hay for the logs of Himalayan box which he had sent down; and that, in consideration of the valuable information communicated by Mr. Jephson, and of the

expense and trouble to which he was put by the Society's second reference, a premium of the same value (Rs. 500) be awarded to that gentleman.

It has been thought desirable, as closely connected with the above subject, to introduce, in conclusion, the following communication from Dr. Alexander Hunter, Secretary of the School of Industrial Arts, Madras, to whom two of Capt. Hay's logs were forwarded for report :—

My dear Sir,—I was truly sorry to find that I had neglected to acknowledge the receipt of your letter regarding the two logs of Himalayan Box-wood kindly forwarded to me in December or January last. I remembered having sent an acknowledgement for them to some one, and was surprised at not having done so to you, but I remember now that your letter was sent down to the Custom house and kept by one of the Clerks as a voucher for the logs, and I thus lost the name and address, but on referring to my letter book I find that, on the 16th of February, I wrote to George Jephson Esq., Simla, and to Capt. Maclagan, Roorkee, thanking them for the logs, and sending them proofs of wood cuts done upon them. Since then I received a letter from Capt. Maclagan, and some separate prepared pieces of Himalayan Box-wood, with proofs of engravings done upon it at Roorkee. I have not heard again from Mr. Jephson, who I believe sent me one of the logs.

I have now given the wood a fair trial and have much pleasure in sending you proofs of some wood cuts executed upon it. I have no hesitation in saying that it is very nearly equal to the Turkey Box-wood and cuts very cleanly and smoothly, yielding delicate lines and working well, in the press. It is not quite so hard as some Turkey box, that we lately procured from England, but this may be the mere difference of age of the tree, or time that the blocks have been cut. I have found by experience, that all the good woods we have tried, as guava, Hill orange, and sandal,

have hardened after a time, and particularly so after having been printed from. The small Hill orange and sandal wood, after standing for five or six years, have become as hard as Box-wood. This I think is partly owing to the oil absorbed from the printing ink, though not entirely, for on turning the backs of the blocks and planing them down a little, they are harder than when first engraved upon. But this hardness is not of much consequence as the wood is unquestionably well suited for engraving, and will yield lines of all descriptions as the accompanying proofs will show. With care I should think that 15 or 20,000 impressions might be obtained from a block, but not if handed over to the tender mercies of the ordinary newspaper printers. I send you an illustrated article written for the supplement of the Madras *Daily Times* and *Spectator* with cuts on the wood you sent, and proofs since printed in our School by hand, to show you the difference of printing. There is an unnecessary degree of pressure used in most newspaper printing that blurs the impression and occasionally spoils the blocks. I should feel much obliged if you would kindly let me know the districts in which the Box-wood grows, also whether it does not vary considerably in size, hardness, and color, according to the soil or climate. The English and Turkey Box-woods vary very much. The old wood of a moderate size grown on hilly localities being the best. With many thanks for your kindness in sending the Himalayan Box-wood,

Believe me, &c.,

ALEXANDER HUNTER,
*School of Industrial Arts.*

MADRAS:
24*th May*, 1860.

*Mode of rearing the Tussur silk worm in the District of Palamow: Communicated by* W. H. Pringle, Esq.

By this day's Banghy post I have despatched to your address the leaves and seed, carefully labeled, of a fibre-yielding tree, also leaf, flower, and seed of another, the Assun [*Terminalia tomentosa*]. This is the tree on which is fed the worm that forms the cocoon (muster sent you); it is also a large tree growing very straight and found in large numbers a mile or two generally from the hills, the timber is fine and substantial, color something between the Teak and Toon. There are strict orders enjoined with a penalty of four rupees for cutting a single tree; with all this the tree never thrives well owing to the worms fed on it; what with the feeding of the worms, the taking down of the cocoons, every tender branch is broken so that the tree is left perfectly bare and of no use the next season, or until it has had a rainy season over it when it flourishes again. The cocoons sent you are from the Assun. The moths come out about the middle of June, the males are small with a large red dot on each wing, those of the other sex much larger, fuller made in the body, particularly the hinder parts. Some two or three hours after the moths have burst out of the cocoons they are mated for a half hour; the males then shut in a basket and the females have their wing tied close to the shoulder, and put on a board or bamboo flooring, when they immediately commence laying, the wings are tied to prevent their flying away, the next day the eggs are collected from under them and a few of their wings plucked and gently rubbed in the hand to a powder, the eggs are put in this powder and shakened till they separate, it is then put into a thin piece of cloth tied and carefully put away so that the ants do not get at them: this is continued daily, each moth laying for three or four days, when from exhaustion she dies. It will be observed that for each day's collection is a separate bundle formed; on the eighth day they are hatched

into worms and immediately taken to the jungle, a nest formed on a tree (Assun) by carefully tying a lot of leaves without separating them from the tree, in form like a cup. In this the piece of cloth containing the worms is placed; in four days, they grow to the size of an inch, they are then removed to other trees, and as they grow larger are from time to time diffused over a large number of trees. From the day the little worms are first put to the trees boys are employed in scaring the birds, particularly crows and kites, and as the worms are from time to time scattered the boys proportionately increased; the number of boys in a full working field averages from 12 to 20, the worms grow to the size of five to six inches long and one thick, when they commence to spin. After formation into cocoons they are allowed to remain a week on the trees to harden them, taken down attached to the small twigs, and daily laid out in the air to dry. From the time the worms are put to the trees and the cocoons taken down occupies a month and half or end of this month (July.) About the middle of July purchasers commence to gather about the fields from Patna, Dawidnuggur, and other large towns, when an exchange is made at three to six r pees the thousand; the thousand is by previous engagement made to consist of eleven to thirteen hundred: the burst cocoons also find ready market at two rupees eight annas per thousand to three rupees for June and July produce, but those of October four rupees. A second crop commences between the latter end of August and beginning of September when the same process as above described is again gone through; the difference of the two crops is, the second is more full and larger and from having the sun more regularly becomes harder. The revenue or Malgoozry for a silk field is (3) rupees three for each cutter or full grown man who is expected to take the cocoons down; at an average there are three of these to a good sized field covering some thirty biggahs of land.

# Monthly Proceedings of the Society.

*(Wednesday, the 11th January 1860.)*

W. G. Rose, Esq., Vice-President, in the chair.

Read a note of apology from the President for not being able to be present at the Meeting in consequence of professional duties requiring his particular attendance elsewhere.

The proceedings of the last Monthly Meeting having been read and confirmed, the Meeting proceeded, in accordance with the Bye Laws, to the election of Officers and Council for the current year, appointing Messrs. J. B. Roberts and J. F. Galiffe, Scrutineers, who reported the result to be as follows:—

*President.*—Dr. Thomas Thomson.

*Vice-Presidents.*—Mr. C. A. Cantor, Rajah Pertaup Chunder Sing Bahadoor, Mr. A. Grote, and Baboo Peary Chand Mittra.

*Secretary.*—Mr. A. H. Blechynden.

*Council.*—Baboo Shib Chunder Deb, Mr. S. P. Griffiths, Baboo Ram Gopal Ghose, Rev. James Long, Mr. S. H. Robinson, Mr. C. B. Wood, Dr. F. J. Mouat, Mr. W. G. Rose, Baboo Gobind Chunder Sen, Mr. E. Prestwick, Mr. T. E. Carter, and Dr. J. B. Barry.

*Standing Committees.*

The revision of the Standing Committees was next considered, and the names of the following Members were added where vacancies had occurred, *viz.*, for the Cotton Committee, Messrs. C. A. Cantor and H. A. Hurst; Floricultural Committee, Messrs. W. Stalkartt and W. F. Gilmore; Fruit and Kitchen Garden Committee, Mr. Cantor. The Silk, Hemp, and Flax Committees were divided into two Committees, *viz.* the Silk Committee, consisting of Messrs. Willis, Rose, and Prestwich, and the Fibre Committee, consisting of Messrs. Stalkartt, Robinson, Lauder, and Weskins.

*Annual Report.*

The Secretary read the Annual Report.

Proposed by Mr. J. B. Roberts, seconded by Mr. J. F. Galiffe, and carried unanimously, that the Report of the Council be received and adopted.

The ordinary business was then proceeded with, and the following gentlemen, who were proposed at the last meeting, were duly elected Members, *viz.*, Dr. G. A. Burn, Messrs. H. A. Hurst, James Smith, Dr. Charles Wilson, Messrs. E. J. Lindsay, Herschel Dear, William Anderson, and H. E. Braddon.

The names of the following gentlemen were submitted as candidates for election :—

Lieutenant R. Stainforth, Police Corps, Gondah,—proposed by Mr. Grote, seconded by Dr. Thomson.

J. S. Frepanges, Esq., Merchant, Akyab,—proposed by Dr. J. W. Mountjoy, seconded by the Secretary.

J. P. Miek, Esq., Kissengunge, Nuddea,—proposed by Mr. W. G. Rose, seconded by Mr. S. P. Griffiths.

J. M. G. Cheek, Esq., Bancoorah,—proposed by Col. Hannyngton, seconded by the Secretary.

---

The following recommendation of the Council, of which notice was given at the last meeting, was submitted and carried :—

" That Section 5 of Chapter V. of the Bye-Laws be altered as follows :—

Instead of the words " *whose subscriptions are three quarters in arrear,*" the words " *whose subscriptions are in arrear,*" and instead of the words, " *four quarters in arrear,*" the words " *more than one quarter in arrear.*"

## *Nursery Garden.*

A Report was submitted from the Garden Committee, recommending certain improvements to the garden, in the shape of additional walk, additions to the gardener's house, writer's office, &c. ; all which were adopted.

A partial report from the gardener was also placed on the table, respecting trial sowings of seeds of field crops forwarded per *Ida Zeigler* by Messrs. James Carter and Co., of London : about 50 out of 80 kinds had germinated most freely up to date, notwithstanding the consignment had been nearly eight months in the vessel. A fuller report will be given at the next meeting, with a list of such additional kinds as may have then germinated.

---

The Council announced that they had fixed on Thursday, the 26th January, for the first show of the season, and on Wednesday, the 29th February, for the second show.

It was agreed, in the event of tents not being available, that the site be changed from the Auckland Garden to the Town Hall.

*Communications on various subjects.*

The following papers were also submitted :—

1.—From Captain Thomas Hutton, Superintendent Government Silk Plantations, a long and interesting paper on the *Cultivation of Silk in the Himalaya Mountains, with Notes on the treatment of the Silk-worm.* Ordered for publication in *Journal, Vol. XI., Part* 2.

2.—From H. Cope, Esq., Umritsur, two communications, dated 20th and 30th December, on the subject of Putchuck and its adulteration :—

"At a recent meeting of your Society you acknowledge the receipt from Mr. Reginald Saunders, Deputy Commissioner of Kangra, of samples of the two roots named respectively Koot and Toot in this Province. The former, as you correctly mentioned in the Report of the proceedings of the meeting at which the samples were presented, is exported to a large extent to China under the name of Putchuk, so largely indeed as to have induced the dealers in the article, in Umritsur especially, to resort to the extensive adulteration of the drug ; and this adulteration is now carried to such a pitch with the assistance not only of the Toot above mentioned (the root of which so closely resembles the genuine article in every respect but its qualities, that it is difficult to distinguish the one from the other after admixture, which imparts to the false the odour of the true drug,) but with other foreign substances, of which COWDUNG is one, that I have ascertained as a fact that the more unscrupulous dealers use some 20 seers of the Koot to "flavour" 100 seers of trash. It, however, happens that while the root of the AUCKLANDIA *veracosta* is sold here at from Rupees 12 to 15 a maund, the adulterated mixture is disposed of in the markets of Bombay and Calcutta at from Rupees 11 to 12 per maund, and then yields a large profit to those whom I cannot call by any other name than cheats of the worst kinds. When I asked one of the largest traders in the place why *he* resorted to such dishonest practices (he having admitted the adulteration), he replied that he must needs do as others, or lose the custom of his correspondents at Shikarpoor and Futtehghur. It strikes me that a little wholesome publicity may be useful in checking the practice I have detailed, and I shall be obliged by your submitting this letter with reference to Mr. Saunders' samples to the next meeting of your Society. I may add that when Toot was first found *useful* as an admixture, it was sold at Rupees 1-8 per maund; being now the *main ingredient* of the Putchuck of commerce, it has risen to Rupees 4-8 ! !

"*P. S.*—Some twenty years ago Dr. Falconer mentioned an aromatic root to me as a bane of white ants. The Putchuck or Koot has the same reputation of being so, and I have small doubt that it is the root that was

alluded to by Dr. Falconer, of which the origin was then unknown. I propose trying the effect of the Putchuck on this insect, and will report the result.

"With reference to my previous communication respecting the shameless adulteration of the Putchuck root carried on here, I am told that two other substances resembling this genuine article in exterior appearances have been ascertained by me to serve as ingredients in the mixture sent to Calcutta and Bombay for exportation to China, under the name of K'hoot or Putchuck. They are respectively a root called *Chog*, brought from the Hills, the origin of which I have not ascertained, but is generally reported to be a deleterious drug (may be the *Chokha* mentioned by Balfour as a root obtainable at Delhi), and *Nirbisi*, the root of a species of *Aconitum*, and hence probably a virulent poison."

3.—From Colonel Phayre, submitting, on behalf of Lieutenant Lloyd, Deputy Commissioner of Tharawaddy, five samples of Tobacco of sorts raised in that district.

The Committee report that these samples are in too dry a condition to admit of a fair opinion, and recommend that larger and fresher samples be forwarded.

*Resolved* that a copy of the Committee's Report be sent to Colonel Phayre.

4. From Captain C. P. Molony, Secretary General Committee Madras Exhibition, dated 25th October, enclosing copy of a letter to his address from Mr. Levinge, Collector of Tinnevelly, respecting samples of silk forwarded by him to the Madras Exhibition. The Committee are of opinion that the samples in question must be the produce of the "True Silk-worm," and send specimens of worms, moths, and cocoons to the Society with the view of determining the point.

The Chairman observed that the specimens forwarded belonged to a species or variety of the Silk-worm of commerce *(Bombyx Mori)*, apparently the kind known in Bengal as the *Dessee Pooloo*, or monthly worm. The cocoons were inferior to those raised in Bengal, arising probably from out-door feeding or want of care.

Mr. Levinge states that the silk produced from these worms is manufactured to a very limited extent in the province of Tinnevelly, and that nearly the whole is exported to the neighboring districts of Madura and Tanjore.

The maximum and the minimum rates at which the silk is sold at Tinnevelly Mr. Levinge reports to be Rupees 11 and 8 respectively per viss of Rupees 120 weight.

It was agreed, in replying to Captain Molony's letter, to apply for a sample of the silk in question, and for particulars as to the mode of rearing, &c.

5. From R. Sturrock, Esq., Secretary Chamber of Commerce, Dundee, dated 11th March, giving the following report on the samples of Punjab-grown flax received from Mr. Cope, and presented at the meeting of July 1859 :—

"With reference to your letter of 6th August, the samples of flax have been received and examined, and I have now to report that at the *present time* a price equal to £40 to £45 here could be got for the stock, provided that seen is a fair sample. That from the acclimated seed is the best, but still I do not quote a separate price.

"As to the quality, it is not nearly so good as a lot sent home by Mr. McLeod, which I sold at £54-10 per ton. It is not so good colored, is altogether harsher, and much less of the natural sap in it. This we consider must arise from the stock having been allowed to grow too long a time, or not having been pulled early enough, and from over steeping, or otherwise bad preparation. It is however strong, and yields well on the heckle.

"As stated before, if any thing is to be done, this or any future quantity should be sent to this market *as early as possible after being ready.*

"I may mention that from reports of the crops on the continent flax is likely to be rather cheaper than otherwise.

"Please advise your friends as to this, and I hope to be advised soon of a shipment."

*Resolved* that a copy of the above Report be communicated to Mr. Cope, and that enquiry be made whether the plants from which this flax and that sent to Dundee by Mr. McLeod were prepared were allowed to ripen seed.

6. From James Cowell, Esq., forwarding a quantity (about 5 seers) of fresh Madder seed received Overland.

The best thanks of the Society were tendered to Mr. Cowell for his kind assistance. The Secretary announced that a portion of this seed had been sent to Darjeeling, Mussooree, and the Punjab, and a small quantity was reserved for other applicants.

7. From R. Sturrock, Esq., Secretary Chamber of Commerce, Dundee, dated November 5th, acknowledging receipt of report of Society's Special Committee on Flax, and returning the thanks of the Chamber for this and the Society's attention at all times.

Mr. Sturrock encloses a printed copy of a memorandum from Mr. D. F. McLeod on the supply of Flax from the Punjab, which appeared originally in a recent number of the *Dundee Advertiser.*

*Resolved* that the memorandum be published for general information in the proceedings of this day's meeting.

MEMORANDUM REGARDING THE SUPPLY OF FLAX FIBRE FROM THE PUNJAB.

*By Mr. McLeod, Financial Commissioner at Lahore.*

There appears to me to be three requisites for securing (prospectively) the supply required.

*1st.* A person authorised to make advances to cultivators, for, without advances, the bulk of producers in India are helpless.

*2nd.* Persons competent to instruct them in the proper mode of cultivating and preparing the fibre; and,

*3rd.* One or more persons authorised to purchase, on the spot, all the marketable fibre that may be prepared.

At first it will not be possible to effect the object in view, save on a very small scale. Past proceedings have not as yet had the effect of either instilling confidence into the natives, or affording any information, so that, virtually, it can hardly be said that a commencement has yet been made. It has been owing only to the zeal of Mr. Ed. Prinsep, Deputy-Commissioner of Sealkote, that any linseed has been cultivated at all in the Punjab, during the present season, for the sake of its fibre; and during a circuit made by me, at the beginning of the present year, I could not discover that the whole area so cultivated exceeded fifty acres. Whatever has been produced has been worked up by the scutchers trained by Mr. Steiner, and purchased by Mr. Cope; but I should doubt whether the whole exceeds 3 or 4 tons (speaking at a rough guess).

Mr. Steiner, as stated by me to the Members of the Chamber, is not sanguine of increasing the amount rapidly at the outset at all events. I have the greatest confidence in that gentleman's judgment on such a point, yet I would venture to hope that, if the matter was entered upon earnestly, the progress might be somewhat more rapid than he anticipates. The individual to whom one of the Government preserves in the Bari Doab has been leased is named Mahomed Sultan. He is a Government contractor, and a native gentleman of rare public spirit and philanthropy. He has considerable resources at command, and were he urged to assist in the matter, by Mr. Cope or other competent person, and trained scutchers placed at his disposal, I have no doubt he would produce a considerable quantity himself; and should he succeed, his example would probably prove contagious. This, however, could only be next year, as this is the sowing season, so that it would be too late to attempt anything this year, and the land has still to be broken up.

There are two special causes why the present season is a most favorable juncture for making vigorous efforts in this matter:—*1st.* That the opening

of the Bari Doab canal this year has rendered irrigation available for extensive waste tracts, some of which are Government property; *2nd.* That owing to the increase of agriculture which has taken place since the acquisition of the Punjab by the British Government, there is now a general conviction that the production of cereals has become excessive, and an anxious desire is in consequence almost everywhere springing up, to discover some other crops for the production of which the country is suited, more especially such as can be exported profitably to foreign lands. I may add, that as Sir John Lawrence is now a Member of the Council for India, and as he is well aware how important it would prove to the public interests of both England and India, if the former could be largely supplied with Flax, he would prove a most influential supporter should any representation on the subject be made to the Secretary of State. Although the conclusion arrived at, that the smallness of the available supply of Flax renders the formation of an Association for superintending the matter undesirable, is one which cannot be deemed unreasonable or cause surprise, yet my own impression is, that the matter may be set on foot more satisfactorily, appropriately, and successfully, by an Association or by a Sub-Committee of the Chamber, than by private individuals. The outlay need be small, and the risk altogether inconsiderable; but such a body would carry weight, and secure the co-operation and countenance of Government officials, to an extent hardly attainable by capitalists entering on the undertaking separately, each on his own account; while the work to be done in the first instance is not so much to procure large supplies of fibre, as to select and train men for supervising, instructing, and conducting operations generally, and through them to create in the natives the desire and the aptitude for producing the article; and this initiatory process being one of a general character, promotive of the interests of all, it seems to me that it might be effected most appropriately by a collective body.

Were Mr. Steiner invited to meet the Members of the Chamber, I cannot but think that advantage must result from the discussion of these matters with him. He is a most conscientious, trustworthy, as well as intelligent and well-informed man, and it is not improbable that among the Germans or others employed in Dundee he would be able to select men of good promise for the post of Superintendents in India. With reference to the cost of export, as it is probable that great rapidity would not be requisite, I imagine that conveyance by boat down the several rivers will in the end be proposed as the cheapest and best mode of transport. The boats at present in use are of a most defective construction, and on reaching Scinde are usually broken up and sold, as the voyage up against the stream usually proves to

them dangerous as well as tedious; but it would not be difficult to plan a superior kind of boat, of light draught, capable of sailing up at any period but that of the heaviest floods; and if so, the whole rivers of the Punjab would appear to be natural highways, by which to export all our surplus raw produce.

I have mentioned that Mr. Steiner has the highest opinion of the fibre of the *Crotolaria juncea,*—the fibre of the *Sunn* or *Taag,*—and as this is the season when the plant is cut (the crop being one of those raised during the rainy season), a boat-load of it could readily be procured and despatched to Kurrachee by Mr. Cope, or by any other person on the spot, who might be authorised to undertake the job,—a communication having been previously opened with some party in Kurrachee who would receive and send it to England.

8. From H. Cope, Esq., dated 19th December, announcing the formation of a Nursery Garden close to the town of Umritsur, and requesting the aid of the Society in the shape of seeds, &c.

" It may be of some interest to your Society to learn that the Municipal Committee of Umritsur have made arrangements, readily sanctioned by superior authority, for the establishment, on a liberal scale, of a large Nursery Garden to be devoted, mainly, to the rearing, for gratuitous distribution among the people, of forest and fruit trees. Those who know the Punjab, and have taken the trouble to visit its markets, must have noticed how absolutely bare are its plains of what may more properly be styled forest trees, while the absence of all but the most common fruits, and those of the worst kind, is a striking want in the domestic economy of the people. There are parts of the Punjab where fruit of any kind is absolutely unknown, and the establishment of more nurseries, such as that now contemplated, is most desirable. Mr. Roberts, the Financial Commissioner, has in a recent Circular drawn especial attention to the subject, and most of us must remember the excellent Minute regarding tree plantation prepared by Lord Dalhousie, and which it would be worth your Society's while to publish in your journal. I can furnish you with a copy, if you should wish to do so. The Umritsur Nursery will also embrace the rearing of a few ornamental trees, shrubs, and flowering plants, the townspeople especially having manifested a desire to possess such (from possessing they may take to rearing them). In this respect considerable progress has already been made. I have, at this moment, upwards of 15,000 annuals in small pots ready for distribution, having reared them at the desire of the Committee at a comparatively trifling cost.

The Committee having requested me, as one of their Members, to superintend the formation of the new Nursery Garden, I shall esteem it a favor if your Society will be good enough to assist us with suggestions, and also with such a supply of seeds (especially agricultural) as you can conveniently spare. I have already to thank yourself for considerable aid in English flower seeds, and I trust to be able to give you a good account of our proceedings in due time.

"The Nursery Garden ground is nearly fourteen acres in extent, with a magnificent well, and the advantage of canal water. The soil is good. The site adjoins the Ram Bagh, and is comparatively near the town."

*Resolved* that every assistance be rendered, and that a portion of the consignment of field crop seeds, recently received, be forwarded to Mr. Cope.

It was further agreed to reprint Lord Dalhousie's Minute in the department of Selections of the next No. of the *Journal.*

Several copies of the *Journal, Vol. XI., part* 1, recently received from the Press, were placed on the table.

For the above communications the best thanks of the Society were accorded.

---

*(Wednesday, the* 15*th February* 1860.*)*

Dr. Thomas Thomson, President, in the chair.

The proceedings of the last Monthly Meeting were read and confirmed, and the following gentlemen elected members :—

Lieutenant R. Stainforth, Messrs. J. S. Fressanges, J. P. Meik, and J. M. G. Cheek.

The names of the following gentlemen were submitted as candidates for election :—

Stephen Lushington, Esq., C. S., Pooree,—proposed by Mr. A. Grote, seconded by Mr. H. T. Prinsep.

J. L. Turnbull, Esq., Merchant, Calcutta,—proposed by Mr. W. G. Rose seconded by Mr. C. B. Wood.

J. F. Curtis, Esq., Indigo Planter, Tirhoot,—proposed by Mr. C. B. Stewart, seconded by the Secretary.

G. Pepper, Esq., C. S., Tipperah,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

Baboo Sumboo Chunder Roy Chowdry, Rungpore,—proposed by the Secretary, seconded by Baboo P. C. Mittra.

A. Bruckner, Esq., Merchant, Calcutta,—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Creswell.

The following presentations were announced:—

1. Selections from the Records of the Government of India, No. 27. Presented by the Government of Bengal.

2. Selections from the Records of the Government of Bengal, No. 31 (2 Copies). Presented by the Government of Bengal.

3. The Annals of Indian Administration, Part 4 of Vol. 3. Presented by the Government of Bengal.

4. Several kinds of seeds, yams, &c., from the Barrackpore Park. Presented by Mr. C. Sharpe.

5. A quantity of seed of *Centrosemma Braziliensis.* Presented by Dr. Cantor.

6. A small assortment of vegetable and flower seeds from Berlin. Presented by Dr. Halleur.

7. Some dahlia bulbs from Mussooree. Presented by Captain Thomas Hutton.

8. Several kinds of millet raised in the Jessore District. Presented by H. G. French, Esq.

9. Musters of cotton raised from exotic seed, and of arrowroot, the produce of the Baraset Public Garden. Presented by Baboo Nobin Chunder Doss, Secy. L. C. P. I., Baraset.

10. Two samples of Pekoe teas raised at Debrooghur, Upper Assam, from Assam and China stock. Presented by W. G. Wagentrieber, Esq.

11. A specimen of the fibre of the *Badoolee lutta* of Assam *(Pederia fœtida)*. Presented by Colonel Jenkins, on behalf of Colonel Hannay.

This beautiful silky fibre, as also the tea and cotton samples, were referred to their respective Committees for report.

---

The Council reported that they had elected the following members to their Sub-Committees :—

*Finance.*—Messrs. C. A. Cantor, Peary Chand Mittra, and S. P. Griffiths.

*Papers.*—Mr. Grote, Dr. Thomson, and the Rev. J. Long.

*Correspondence.*—Messrs. W. G. Rose, A. Grote, and C. B. Wood.

*Provision of Vegetable, Flower, and Agricultural Seeds for* 1860.

Read the following report of the Garden Committee :—

Your Committee have to report on the above subject as follows:—

*Seeds from North America of Vegetable, Cotton, Maize, and Tobacco.*—These have succeeded well altogether of last year's consignment, and a similar order has been given for next season, with the addition of 25 extra packets of vegetable seeds.

*Seeds from the Cape of Good Hope.*—The last consignment from Messrs Villet and Son has given satisfaction generally. The Committee have therefore ordered another from them, with an additional 25 packets. Messrs. Villet have, however, been told not to send, in future, any of their "*Early* Pea," which is an inferior description and a misnomer; they have been instructed to include either some other new and good kind, or to increase the quantities of the Marrowfat, Imperial, and Prussian Blue Peas.

Both the consignments from North America and the Cape reached late last year. The seedsmen have been directed to ship the seeds so as to reach this in all July.

*Flower seeds from England.*—The Committee recommend that 25 additional packets be likewise ordered from Messrs. James Carter and Co., but they suggest that the number of varieties be considerably reduced, say one half, as several of the kinds sent last year have become common, whilst others, however well adapted for an English climate, are scarcely suitable for this country. The Commitee annex a list of the kinds they propose should now be indented for, giving a larger quantity of seed in each paper, thereby not lessening the total quantity, but making the assortment more choice.

*Agricultural seeds from England.*—The consignment of field crop seeds forwarded last year by Messrs. Carter and Co. did not arrive, as already reported, till the beginning of December instead, as expected, in all July, in consequence of the *Ida Zeigler*, having been obliged to put into Rio de Janeiro for repairs. It has accordingly been determined to reserve the greater portion of this consignment for early distribution next season. The trial given to these seeds have proved so favorable, notwithstanding their long detention in the hold of the ship, that it is evident they had been well assorted and well packed. Your Committee have accordingly given another order to Messrs. Carter for a consignment to reach this in July, which can be distributed independently of last year's supply.

The Committee beg, in conclusion, to add a memorandum of the probable cost of these consignments independently of contingent charges.

MEMO.

| | | |
|---|---|---|
| Seeds from North America | Co.'s Rs. | 2,750 |
| Seeds from Cape of Good Hope | | 2,020 |
| Seeds (flower) from England | | 2,350 |
| Agricultural seeds from England | | 1,000 |
| | Co.'s Rs. | 8,120 |

(Signed) W. G. ROSE.
„ C. A. CANTOR.
„ S. P. GRIFFITHS.

It was agreed that a quantity of acclimatized cauliflower seed be also obtained from the Upper Provinces.

*Horti-Floricultural Exhibition.*

Read the following reports of the judges respecting the show of vegetables, fruits, and flowers, held in the Town Hall on the 26th January 1860:—

*Horticultural.*—The first show of last year was considered as good as any of its predecessors, and better than many. The present show the judges consider about the best that has been held, both as respects the quantity and quality of the produce submitted. A few remarks on some of the articles exhibited may be added. Of cauliflowers, the collection was in every respect excellent; many baskets were brought forward with large, compact, and fair heads. Cabbages of various sorts, more especially the finer kinds—sugar-loaf and early York—showed well. The same remark is applicable to turnips, carrots, and leeks. The peas were very superior to those of last year; besides the imperial Prussian blue, and two or three other kinds, the Victoria and scymitar were exhibited. This remark is likewise applicable to the potatoes, which were well represented. The celery did not show any improvement, and the asparagus (out of season) was very poor.

Among native vegetables, there were many good samples of beans, yams, and other sorts common to the season.

The display of fruits was satisfactory, including several excellent baskets of sapotas, plums, pomegranates, pine apples, and pummelows (both out of season), oranges, custard apples, &c.

The competition was spirited, and prizes amounting to Rs. 283 were awarded to 50 gardeners: not less than 200 were in attendance.

(Signed) W. G. Rose.
" P. C. Mittra.
" C. A. Cantor.
" T. A. C. Firminger.

*Floricultural.*—The present show can scarcely be considered an improvement on the first exhibition of last year, which was not equal to that of 1858. The competition was about the same as 1859, namely, the produce of twenty gardens, of which 13 received prizes as per list annexed.

The collection of roses was good, especially those from the Barrackpore Park and the Rajah Pertabchunder Sing's garden. In the small collection from Mr. J. S. Elliot's Garden was a new rose, named *Madame Prudhoe.*

A few well-grown Camellias were exhibited. The display of heartsease was very fair; a few good plants of violets were placed on the stands.

The number of visitors, though not equal to last year's attendance, was nevertheless, considerable.

(Signed) Thos. Thomson.
" A Grote.

*Nursery Garden.*

A tabular statement was submitted by the gardener of the percentage of germination of 69 kinds of seeds of field crops forwarded by Messrs. James Carter and Co., per *Ida Zeigler.* The average percentage is 66, but some kinds have germinated 99, 98, and 97 per cent.; others 88, 86, and 84.

The French madder seed received through the kind agency of Mr. James Cowell has yielded 43 per cent. The gardener states that he has now a fine collection of fruit grafts ready for distribution; the sugarcane is ready for cutting, and the arrow-root for lifting.

*Cotton.*

A report from a section of the Committee (Messrs. Cowell, Hurst, and Cantor,) was submitted on various samples of cotton received during the last quarter of 1859. The cotton raised by Mr. L. Berkley in the Delhi District from Mexican and New Orleans seed, is considered superior to the others, and of the description chiefly required by the Manchester manufacturers, who could consume almost any quantity at a reasonable price: these are valued at from 7*d.* to 7½*d.* per lb. One of the members (Mr. Hurst) recommends that these samples, as also others, be forwarded to the Cotton Supply Asso-

ciation for their information, and offers to take charge of them for that purpose; which offer was accepted with best thanks.

*Artificial Irrigation.*

Read the following extract of a letter from Mr. R. W. Bingham, of Chynepore, Sasseram, dated 2nd January :—

"I am busy with a small cotton plantation from seeds which I received direct from the Manchester Cotton Supply Association, and the plants sown in July and August are most promising, and are now beginning to pod abundantly. The Sea Island cotton plants are growing luxuriantly, and are about 4 feet in height: they are just beginning to flower, but I am sorry that so few of the seed of that description germinated. The Chinese Nankeen cotton also appears to be admirably adapted to this climate. When I have reaped my first crop, I purpose giving you a full description of the mode of cultivation which I have adopted and the amount of irrigation I have given, but such a report just now would be premature. So far, however, I am sanguine as to the success of cotton planting in India if conducted with care and energy, and if the Government can only be urged to double their own revenue and give us irrigation works with one and the same measure on the plan of Captain Dickens, Bengal will not long bear the palm of the garden of India; but we *must* have irrigation. Let the Government, however, work as energetically as they may in the matter, the necessary works will cost time,—time which can ill be spared. It has struck me, therefore, as a measure within the scope of the Society's plans, to invite plans, and if the funds will allow it, to offer a prize or prizes for the best, cheapest, and simplest means of raising water from tanks or rivers, for irrigation purposes, say, something of the windmill and Persian wheel combined, as steam for obvious reasons is out of question in the Mofussil at present. I only throw out this suggestion as a straw upon the current. It must be borne in mind, however, that the plan to answer must be cheap, efficient, and not liable to get out of order; and if it should do so, repairable by the common native carpenter."

It was agreed that the above form part of the proceedings of this day's Meeting, with the view of attracting attention to the subject and inviting suggestions thereon.

The Secretary brought to the notice of the Meeting, in reference to the foregoing, a correspondence with Dr. Buist during the years 1845-46 on the application of wind-mill power in India for irrigation and for other purposes. He also submitted the first number of a work on *Wind Mills* by

Dr. Buist, in folio size; and stated that he was not aware whether a second number had been published.

*Resolved.*—That a communication be made to Dr. Buist on the subject, and his attention called to Mr. Bingham's letter.

*Cultivation of the Imphee plant in Bengal and Behar.*

The Secretary placed on the table an abstract of Returns to the Circular Order of the Board of Revenue on the above subject.

Agreed that it be published in the number of the Journal now in the Press.

*Flax cultivation in the Punjab.*

The Secretary brought to notice a report in the *Dundee Advertiser* of the 6th January (which he had received by the last Mail from the Secretary of the Dundee Chamber of Commerce,) of a large Meeting held in that town on the previous day, on the subject of a supply of flax from India, and drew attention to a statement made at that Meeting by Mr. Steiner, late Superintendent of Government Flax Operations in the Punjab.

*Resolved.*—That the statement in question be embodied in the newspaper proceedings of this Meeting for general information.

---

*(Wednesday, the 14th March 1860.)*

Dr. Thomas Thomson, President, in the Chair.

The proceedings of the last General Meeting having been read and confirmed, the following gentlemen were elected Members :—

Messrs. S. Lushington, C.S., J. L. Turnbull, J. F. Curtis, G. Pepper C. S., A. Bruckner, and Baboo Sumboo Chunder Roy Chowdry.

The names of the following gentlemen were submitted as candidates for election :—

J. W. Quinton, Esq., C. S., Bulleah, Ghazeepore,—proposed by Mr. J. H. Bax, seconded by Mr. C. M. Armstrong.

C. R. Crommelin, Esq., Deputy Commissioner, Roy Bareilly,—proposed by Dr. A. Campbell, seconded by Mr. A Grote.

Captain W. G. Hutchinson (28 M. N. I.), A. C. G. Moulmein,—proposed by Captain E. H. Power, seconded by the Secretary.

A. Shakespear, Esq., C. S., Moradabad,—proposed by Mr. H. V. Bayley, seconded by Mr. A. Grote.

A. K. Dyer, Esq. (Mercantile Bank of India),—proposed by Dr. Thomas Thomson, seconded by Mr. C. A. Cantor.

E. D. Kilburn, Esq., Merchant, Calcutta,—proposed by Dr. Thomson, seconded by Mr. Cantor.

Prince Mahomed Julaloodeen, Russapugla,—proposed by Prince Mahomed Ruffee-oo-deen, seconded by Baboo Peary Chand Mittra.

The following contributions were announced :—

1. An engraved portrait of the late Dr. Wallich. Presented by C. A. Cantor, Esq.

2. A few seeds of *Eucalypti,* and of the "Wattle" tree of Australia. Presented by Captain Thomas Hill.

3. A few seeds from Mauritius of the "Bois noir" *(Acacia Lebbek),* and a copy of the Journal of the Natural History Society of Mauritius. Presented by Joseph Agabeg, Esq.

4. A small quantity of seed of Pala Indigo *(Wrightea tinctoria).* Presented by J F. Fischer, Esq.

5. A few yams raised at Port Blair from Nicobar stock. Presented by Captain H. B. Weston, on behalf of Captain Hodges.

6. A few yams from Aleppee. Presented by Mr. H. J. Butler.

7. Some "wild cotton," and a "marine plant," from the Nicobar Islands. Presented by Capt. Tulloch of the *Day Dream.*

This "wild cotton" is evidently from Pernambuco stock, and is considered equal in quality to what is known in commerce as Brazilian cotton. Capt. Tulloch says, that the trees from which this cotton was taken are of a very large size, and growing wild on the island. He could obtain no information from the natives in respect to its history, or when introduced.

A nicely flowering plant of a tea-scented rose (Rosa Madame Danmaizi), from Mr. J. Manuel's nursery, imported in January last from England, was also placed on the table.

*Horti-floricultural Exhibition.*

Read the following Reports of the Judges on the second show of vegetables fruits, and flowers, held in the Town Hall on the 29th February :—

Horticultural.—The present show, though perhaps not quite equal to that of February 1858, was as good as the second show of last year.

The cauliflowers, cabbages of the more delicate kinds, endives, lettuces, carrots, turnips, and potatoes were well represented. Of peas, though late in the season, there were several good baskets. The artichokes were pretty fair, but better may be expected at the next show. Many other kinds of vegetables were introduced. There were also some plants of rhubarb.

In the fruit department were several kinds, including a few, such as the custard apple tribe, pine-apples, and pummelows, out of season. The pome-

granates were, perhaps, better represented than any other fruit. The owner of the best specimen received a medal in addition to money prize. Some good strawberries were also placed on the stand. Of sapotas, loquots, mulberries, &c., there were several baskets.

Of native vegetables the collection was not so varied, but it comprized several good specimens of beans, capsicums, tomatoes, maize, and the cucurbitaceous family.

C. A. CANTOR.
JOSEPH AGABEG.
THOS. A. C. FIRMINGER.

FLORICULTURAL.—This was a tolerably fair show, though not equal to the second show of last year, and decidedly inferior to that of 1858. The competition was not so great, there being only 25 gardens represented on this occasion against 31 of last year; and only 15 gardeners received prizes amounting to Rupees 112, against Rupees 136 awarded to 20 last year.

The plants most worthy of notice were the Franciseeas—a group of 20 well-grown plants, consisting of F. latifolia, uniflora, confertifolia, and laurifolia.

The collection of Orchids was small (consisting principally of Dendrobes of 4 or 5 kinds, of Phaius, Cypripedium, Oncidium, and Cœlogyne), but there were some good plants among them for which prizes were given.

The show of roses contrasted unfavourably with that of last month; it was decidedly poor: two new kinds were exhibited from Mr. J. S. Elliot's garden, which received notice.

The collection of Pelargoniums was good, especially that from Mr. R. Wood's garden, which consisted of 14 exceedingly well-grown plants.

Among the Verbenas and Phloxes a few new kinds were submitted for inspection.

A few well-grown plants of Picotees from Madame Quillet's garden were introduced;—quite a novelty.

The assortment of stocks was about the best exhibited; nearly all were in fine perfect blossom.

The Royal Botanic Garden and the Society's Garden likewise contributed, not for competition, but for exhibition only. The total number of plants from the former garden amounted to 78, consisting of some well-grown orchids in flower, *viz.* Angrœcum superbum, Vanda gigantea, Cypripedium venustum, Oncidium ampliatum, and Goodyera procera; of 5 kinds of Begonias, a beautiful plant of the Eupatorium species, a small collection of

annuals, and an assortment of about 40 plants possessing handsome and variegated foliage.

THOMAS THOMSON.
A. GROTE.

*Resolved*—On the recommendation of the Council, that in consequence of the season being so unfavourable, there be no third exhibition this year.

*Cotton culture at Sasseram.*

Read the following extracts of a letter from Mr. R. W. Bingham, dated 2nd March, offering some remarks respecting cotton in connection with his experiments at Chynepore, Sasseram, in the Shahabad district:—

"I find I brought away with me the Society's book, the "Cotton Planters' Manual," which you were kind enough to lend me. I have read it through, and do not think its suggestions are of much use in India, our climatic peculiarities together with differences in soil, and perforce different systems of cultivation, rendering them of no avail. I was particularly much amused by some of the writers, in fact, most of them in the Manual insisting on 10 acres of cotton cultivation with 8 or 9 of corn as the work of one (1) hand. Did I not know that this is done with other descriptions of farm produce, aye, and more too in Old England, I should have thought the writer was hoaxing us. Ten acres per hand indeed! I should be glad to compound with my hands for one-third of that quantity. To show the difference of willing and unwilling work in picking cotton, yesterday morning I and a friend, by way of experiment, went into a cotton field of mine planted with New Orleans seed, and in one hour we had picked 3 seers of kupas from the bolls, while 6 labourers (women) during the same time had not picked altogether half the quantity, and that not so cleanly. This is only one of the difficulties to be contended with, and their name is legion, to those who desire to introduce any thing new to the people. I would also advise all persons who have attempted or are attempting to commence cotton cultivation, to institute a rigid search upon their cotton pickers, or it is probable that half the produce of the finest bolls picked will find its way under the petticoats of the women or inside the dhotees of the men pickers: and, after being spun at home, sent to the nearest weaver, for the purpose of being woven into another *Sarree.* This is no trifling loss to the planter, and tells seriously when balancing his accounts as to the success or otherwise of the cultivation, while for all practical purposes in these petty peculations, the law affords no protection.

"The cotton seed sown by me in July in rows 5 feet apart, both New Orleans, Egyptian, Sea Island, and Chinese Nankeen, are coming on as well as I

could have wished. The New Orleans and Egyptian are now yielding freely, though some of the bolls are effected with a kind of spider, and with a red fly which bores holes into the half ripe boll, and lays her eggs inside, so that when the bolls burst, a number of small flies are ready to take wing; but this I imagine must be borne with, as I see the same insects also infest the American plantations. The Sea Island cotton plants (of which I have not more than 100) look the most promising however, and many of their stems are an inch in diameter, while they are already upwards of 4 feet high. They have now commenced flowering with large yellow flowers, and if the bolls, when they appear, bear any proportion to the flowers, they will be magnificent indeed. The bolls of the New Orleans variety are nearly as large as pigeon's eggs, but the plants, although more branchy, have not the thickness of stem, nor have they attained the height of the Sea Island variety; but the second season's plants are much larger. The leaf of the Sea Island variety is also much more beautiful than any of the others, as it is of a bright deep green and fully the size of a fig leaf. From the appearance of the plants at present they do not look as if sea air was absolutely necessary to them; a few months more, however, will show. The Chinese Nankeen variety is looking remarkably healthy, and has by its appearance and bearing evidently found a congenial soil. I have some few plants in my garden 4 years old, and each year seems to improve them. I had also Sea Island plants 2 years old, but they were destroyed in the Mutinies. All three descriptions, Sea Island, Chinese Nankeen, and New Orleans, however, are not annuals in this district, and I am of opinion that with a good soil each plant will live and bear at least 4 years. I know the second year's plant is much better than the first.

"I shall not again try planting cotton after the month of July; all I did plant after that time—and that was the greatest proportion—is a failure for this season. The plants are healthy, but stunted :—they will not grow, but neither do they show any inclination to die off: so perhaps they may be first-rate stands for next season.

"I was very much amused by reading in a late number of the "Cotton Supply Reporter," a very dictatorial expression of opinion on the part of the Bombay Chamber of Commerce upon some experiments which had been made in cotton cultivation in that presidency under the orders of Government, *that irrigation was rather hurtful than otherwise to the plant.* This just proves the difference of climate which we have to contend with in India, and probably will account for many failures in Shahabad, Mirzapore, Benares, Ghazeepore, and Behar. Irrigation is copiously resorted to even for the common country cotton (Gossypium Indicum): how much more then is it

necessary for other varieties? Such dictatorial expressions of opinion do more harm than good, as most people are apt to be guided in their operations by such forcibly expressed opinions, founded as they are upon data published with the opinion, and the result of following such advice is in another district failure, not because the experiment would not have succeeded well if tried under fairer conditions, but because the conditions of one district are totally inapplicable to another. In giving an opinion from certain data, Government Officials should always be careful to state for what district this opinion is expressed, and then it may be valuable, not otherwise. We want irrigation for most crops in Shahabad, except rain crops, and even for them power to irrigate would often save from immense loss. We have a splendid soil; we have magnificent water-sheds in the Kymore plateau: we have hundreds of streams running to waste. We have had an official survey for irrigation, which shows that irrigation with navigation combined would double the revenues of the district, make it a garden, throw open the resources of Central India in coal, iron, copper, limestone, and timber; and, better still, the irrigation projects have been sanctioned, but nothing is done, and yet our primary, secondary, and tertiary want is irrigation and navigation; but I will say no more on these subjects at present, as I find my pen has far outrun the size of the note originally intended for you. When I can give fair data, I shall let you know full particulars of my cotton cultivation experiments; at present I shall say no more, for fear I should mislead.

*Madder.*—"I am glad to say that two-thirds of the French madder seed you sent me have germinated, and many of the plants have 10 to 12 leaves, and look very healthy. I sowed them in rows, and had them watered occasionally, when the plants began to make their appearance in about 20 days after planting. Do you know whether they will bear transplanting in the rains? If so, I shall transplant them to another spot, as so many seeds more than I had expected having germinated, they are rather thick together in the rows. What distance should the plants be apart? as I imagine the stools will be as large at least as those of asparagus, and perhaps larger. They evidently like a deep rich soil, with abundance of vegetable manure: cotton, indigo stalks *(seet)* appear to suit their constitution. Talking about madder, I have seen in the proceedings of the Society some questions asked, as to whether the Munjeet of Indian commerce is madder. I can answer the question in the affirmative, as some years ago I sent some Munjeet home to a friend in Manchester, a manufacturer, and he had it tried by the dyer of the firm, and

sent me specimens of cloth dyed by "Indian Madder" (the Munjeet I sent him), and also by "French Madder," and pronounced the average French to be 25 per Cent. better than the Indian, but said, the roots I sent him were from too young plants. The dye was of a deeper colour than the Indian, but Munjeet would sell in the Home markets if it could be sent *ground* in air-tight cases, and at such a price as would enable it materially to under-sell the French article. But the question at issue is, I fancy, this, not whether Munjeet is madder, but whether at present sufficient Munjeet of good quality and of old stools could be had for a sufficiently reasonable price to make it worth the while of a speculator to interfere in the matter with sufficient capital to insure success."

*Floriculture at Umritsur.*

Read the following letter from Mr. H. Cope, dated 8th March, intimating his endeavours towards introducing a desire for the culture of ornamental plants among the residents of Umritsur:—

"I have to return my thanks to the Society for the readiness with which they responded to my request for assistance to the public garden at Umritsir, and hope to be able to give a good account of the seeds you have been so kind as to send. The collection, to judge by the list, is a valuable one, and I have no doubt the further supplies promised will be equally acceptable.

I mentioned, in a previous communication, that I had reared a large number of English annuals for distribution amongst the town people, in the hope of gradually inducing a love of flowers among them. With the view of checking waste, and insuring some care of what was *paid* for, I put a small price on the flowers, about enough to cover the cost of the pots, and caused it to be generally known that the *people* might obtain them on application at the Rambagh. At first days passed without any one appearing to avail himself of the opportunity. One or two "Greatmen" asked for small supplies, but shrunk instinctively from the expenditure of *one pice* per pot. By degrees a Kashmeree or two showed themselves, then a few Buneas carried off a small selection. Presently two or three officials came forward as purchasers, and very soon the display they made in their town dwellings, with the assurance that the first announcement was a *reality*, induced more buyers to present themselves, till the number has increased much beyond my expectation. It is real gratification to me to see a whole family shouldering their floral treasures, and carrying them away with a glee that

amply repaid me the trouble I have had in rearing them. Some two or three thousand pots have already disappeared, and I feel assured the move is one that will contribute considerably towards the domestic civilization (in our sense of the word) of the numerous inhabitants of this large town, and aid in diverting their attention from their degrading amusements and the superstitions of their religion and country. Now if something of this kind were adopted at Benares, Agra, and Delhi, I doubt not the result would be beneficial. I only wish you could see some of the youngsters rushing off with their one and two pots of stocks, wallflowers, daisies, and pansees, now and then stopping to smell them or show them to their friends by the way. It would do you good to notice the animation of their countenances lit up with new ideas and notions of the most pleasing character. Many a pice will be earned, and many a pice saved, to purchase if but *one* pot of "those pretty flowers to be had at the Rambagh." Then the care and watering of them, and the watching of new flowers bursting into bloom, will all be incidents in their young life, that *must* work good in their minds. I trust, therefore, I may look forward to your active assistance in seeds for enlarging my next year's operations, if I should live so long."

Letters were also read:—

From Capt. C. P. Molony, Secretary Madras Exhibition of 1860, dated 16th February, enclosing copy of a letter from the Local Committee, Hydrabad, respecting the rearing of the Tussur silk cocoon, and the mode of dyeing silk as adopted by the Teloogoos of the Hydrabad country.

From Colonel F. C. Burnett, Jullundur, dated 4th February, enclosing a translation of a paper from a German calendar on the Sugar Sorgho.

The above two communications were transferred to the Committee of Papers.

From W. Grey, Esq., Secretary Government of India, dated 1st March, requesting that the Society will aid Capt. Haughton, the Superintendent of Port Blair, in his endeavours towards the introduction of fresh staples of cultivation into the Andamans.

*Resolved*—That further supplies of useful seeds, in continuation of the despatch of last year, be sent to Capt. Haughton.

The Council submitted a recommendation for an additional monthly expenditure of 10 Rupees for the native Office establishment. Agreed to.

For all the above communications and presentations, the best thanks of the Society were accorded.

*(Wednesday, the 18th April, 1860.)*

C. A. Cantor, Esq., Vice President, in the Chair.

The proceedings of the last General Meeting were read and confirmed, and the following Gentlemen elected Members:—

Messrs. J. W. Quinton, C. S., C. R. Crommelin, A. Shakespear, C. S., A. K. Dyer, E. D. Kilburn, Capt. W. G. Hutchinson, and Prince Mahomed Julaloodeen.

The names of the following gentlemen were submitted as candidates for election :—

Edwin Mackintosh, Esq., Cawnpore,—proposed by Mr. G. B. Taylor, seconded by the Secretary.

J. F. K. Hewitt, Esq., C. S., Bancoorah,—proposed by Mr. J. M. G. Cheek, seconded by Mr. C. A. Cantor.

A. L. Agabeg, Esq., Calcutta,—proposed by Mr. Joseph Agabeg, seconded by Mr. G. C. Paul.

Mr. Fisk Williams, Calcutta,—proposed by Dr. F. Mouat, seconded by the Secretary.

Lieutenant John Stewart, Artillery, Dy. Comy. of Ordnance, Cawnpore, —proposed by Lieutenant Robert Stewart, seconded by Mr. M. Shawe.

E. J. Chandler, Esq., Sub-Collector, Cawnpore,—proposed by Mr. G. B. Taylor, seconded by the Secretary.

Captain A. P. W. Orr, Lukheempore, Oude,—proposed by Mr. W. G. Rose, seconded by the Rev. J. Long.

Secretary Local Fund Committee, Goorgaon,—proposed by the Secretary, seconded by Mr. W. G. Rose.

C. B. Garrett, Esq , C. S., Midnapore,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

Major W. F. Nuthall, Commanding Pegu Levy,—proposed by Mr. C. A. Cantor, seconded by the Secretary.

The Commanding Officer, 2nd Regiment Bombay Light Cavalry, Neemuch, —proposed by Capt. R. M. Annesley, seconded by Major J. C. Brooke.

---

The following contributions were announced :—

1.—A classified Catalogue of the raw produce of the Madras Exhibition of 1859 (2 copies). Presented by the Government of India.

2.—Two copies of the above work. Presented by the Committee of the Exhibition of 1859.

3.—The Annals of Indian Administration, Part 1, Vol. IV., March 1860. Presented by the Government of Bengal.

4.—Report of the Bombay Chamber of Commerce for 1858-59. Presented by the Chamber.

5.—Eighth Annual Report of the British Indian Association for the year 1859. Presented by the Association.

6.—Synopsis of the known Asiatic species of silk-producing moths, with descriptions of some new species from India. Presented by the Author, Mr. F. Moore, of the India House Museum.

7.—A small quantity of Coffee seed and seed of *Filicium decipiens.* Presented by G. H. Thwaites, Esq., Director Royal Botanic Garden, Ceylon.

8. A collection of Cachar raw products, consisting of woods of various kinds, of bamboos, rattans, oil seeds, raw cotton and seed, and 86 kinds of paddy, as cultivated by Naggas, Kookees, Muneepoorees, and Cacharees. Presented by Lieutenant Robert Stewart, Superintendent of Cachar.

9.—Specimens of neem, kurma, ebony, and rose-wood. Presented by T. A. M. Gennoe, Esq., Superintendent Benares Opium Factory, Ghazeepore.

The following are Mr. Gennoe's remarks on the above samples:—

"I am not certain whether the merits of neem wood, so plentifully grown all over the country, have ever been properly discussed as a material ready at hand for carpenters' and joiners' work. I think it is admirably suited for door panels, rails, sash frames; and in the cabinet makers' line too it may be advantageously used as a much better substitute for toon. The neem wood is light and strong, clean grained, and not at all liable to be attacked by worms. I can almost confidently state, that it resists the action of atmosphere infinitely better than toon or seesoo, whilst in point of value the neem may be procured at one-third less the rate than the latter. I send you by to-day's dâk a small specimen of neem, as also of a wood called kurma, exclusively used by us in making divisions or compartments in our opium chests for the China market. The kurma abounds in the forests along the belt of the Nepal Terai. The wood is somewhat brittle, but of a fine texture, and well adapted, in the absence of the more costly article of maple wood, for picture frames and other delicate work, as it takes a beautiful polish. The colour varies from a greyish yellow to a light chesnut tint.

"I have also enclosed in the case samples of ebony and rose-wood obtained from the Terai forests."

The Secretary mentioned that he had requested Mr. Gennoe to send leaves and flowers of the *kurma,* with the view of identifying it.

10.—A few living cocoons of the Tussur moth of the Coromandel Coast. Presented by Monsieur J. Hayes, Governor of Chandernagore.

Monsieur Hayes mentions, that having lately left Pondicherry with the view of taking charge of the Government of Chandernagore, he has brought with him some living cocoons of *Bombyx Mylitta* for the Society, as he thinks it might be interesting to cross them with those of Bengal."

The Secretary stated, he had lost no time in sending these cocoons (which are larger than those of Lower Bengal) to Captain Hutton at Mussoorie.

11.—Specimens of Tussur cocoons from Hydrabad, male and female, and of the raw silk in its natural state, and also dyed deep orange, black, and red by the Teloogoos.

The Secretary mentioned, that these specimens had reached after the last Meeting, at which an interesting paper on the subject was communicated by Captain Molony, Secretary of the Madras Exhibition of 1860.

It was agreed that these cocoons and a portion of the raw silk in its natural state be forwarded to Captain Hutton.

12.—A sample of Rheea fibre, prepared in England by a patent process. Presented by James Cowell, Esq.

Mr. Cowell submits the following extract of a letter to his address from a correspondent in England regarding this fibre:—

"We enclose a beautiful sample prepared from the Rheea plant by a patent process here, and which would be worth at least £200 per ton. It is taken from the inner part of the rind (between the bark and woody part), and prepared by being steeped in oil for six hours, which prevents injury to the fibre. Formerly the practice of using acids for the separation of fibrous growths destroyed them."

In a subsequent note Mr. Cowell mentions that similar results have ensued in extracting fibre from plants grown in the Regent's Park. The sample is equally beautiful with that now exhibited, which has more the appearance of silk than vegetable fibre.

13.—A pomegranate of an unusually large size, the produce of his garden on the banks of the Adji. Presented by Baboo Bissumber Sing, of Roypore, near Soorool, in the Beerbhoom district.

The Baboo states, that this really fine fruit, which measures upwards of twelve inches in circumference, and is of excellent flavour, is the produce of a tree planted in alluvial and very rich soil. The Secretary mentioned he had applied for grafts for the Society's Garden.

A plant of Bourbon Rose in flower (*Rosa Marquis Balbiano*), imported from England in July last; also a cut specimen of *Rosa Madame de*

*Cambeceres*, from Mr. Manuel's Entally Nursery Garden, were placed on the table.

---

A report was read from the Tea Committee on the specimens of Pekoe tea grown and manufactured by Mr. George Wagentriber at Debrooghur, in Upper Assam, from China and indigenous stock, which were submitted at a previous Meeting. Messrs. DeMornay and Carter consider them to be well manufactured, but being somewhat out of condition, the flavour cannot be strictly tested. Mr. Cantor considers that they only require the sweetness of smell derived by certain ingredients introduced by the Chinese to make them equal in quality to China Pekoe. He values them at 2*s.* 7*d.* to 2*s.* 8*d.* per lb. in London.

*Cultivation of Crops on the right bank of the Damoodah.*

Read the following letter from Baboo Ramapersaud Roy, seeking information as to the kind of crops that are likely to be cultivated to advantage on the right bank of the Damoodah, in reference to the altered state of the country in that direction, consequent on the removal of the public embankments. Specimens of soil are sent with the letter :—

SIR,—I take the liberty of bringing before the Council of the Agri-Horticultural Society the condition of the country on the right bank of the Damoodah, in the hope of receiving suggestions calculated to remedy the evils now extensively experienced.

The Council are aware that the public embankments, which had always been kept up to prevent the country on both sides of the river from being overflowed by the torrents which descend from the hills during the rains, have been given up for the last few years, and that the private embankments have in consequence proved wholly insufficient to prevent the inundation of the lands and the destruction of villages, crops, and cattle. Since then an embankment altogether proof against the encroachment of the river has been erected on the left bank for the protection of the Railway. The consequences of this measure are obvious. The waters which formerly overspread both banks, meeting with an effectual resistance on the left bank, now strikes with double force on the right bank, and spreads devastation over the whole country on that side. Nor is the effect confined to the commencement of the season, or the first heavy falls of rain. The inundation is felt with equal violence every few days, and from the incessant action of the element, the failure of the crops is all but certain.

The inundations, however, bring down earth from the hills, which is deposited upon the fields over which they pass, to an extent varying according to the distance of the fields from the river. The deposit is highly fertilising, and where, as on the fields immediately near the river, it is to a considerable extent, the cultivation is proportionally profitable. The fields which lie further from the river, and being paddy land, and much lower than those that lie nearer, not only receive a small accession of soil from the inundations, but are exposed to the whole fury and violence of the outbreak.

The Rev. Mr. Long, who has observed the changes which have been going on and noticed the quality of the deposit, is disposed to believe that by substituting some other system of cultivation, these lands, which are now altogether ruinous to the ryots, may be rendered profitable. As he has kindly undertaken to communicate all the information he has acquired by his observations, I am induced to request that the Council will be so good as to take the subject into consideration, with a view to the benefit of the people of that part of the country, who, amidst prospects so discouraging, can with difficulty be prevented from abandoning their paternal homes and fields.

*Resolved* that this letter be inserted in the proceedings of this day's Meeting, in the hope of drawing attention to the subject treated of, and of eliciting the required information.

---

Letters were also read :—

From the Junior Secretary, Government of Bengal, enclosing copy of a communication from the Chamber of Commerce, respecting the distribution of a quantity of New Orleans Cotton seed, recently received from the Manchester Cotton Supply Association, and asking the opinion of the Society as to the most eligible sites for giving it a trial.

From Colonel F. C. Burnett, Jullunder, dated April 5, on horticultural subjects generally, of which the following is an extract :—

" I hope you will send me any new seeds you receive, for I always take a great interest in introducing any new plant. I have raised some seedling roses and vines from Malaga grape, and they are looking very healthy. I have also the Pepper tree *(Eucalyptus piperita)*, which thrives well; also the Judas tree *(Robinia gledetschia)*; the best sorts of English strawberries and English mulberries growing well from seed. I have some very fine flax only in small patches, but about 3 feet 8 inches in height, and a large bed of the scarlet flowered flax. I have some nectarine trees

grown from seed, but not grafted yet, so the fruit does not ripen well. I have been grafting, or rather budding, a great variety of roses. I got a few cuttings of roses in a letter, and I find the buds do well if only 4 or 5 days off the plant. I never saw finer roses anywhere than we have here, they seem to thrive so well. I got some yellow rose cuttings from Peshawur that have taken well and are now in flower, though only budded a month ago!"

From Messrs. James Carter and Co., London, enclosing invoice and bill of lading for a quantity of garden tools.

These have been recently received in good condition. The Gardener reports them for the most part first-rate articles, and extrêmely moderate in price.

A correspondence with the Government of India, regarding the recent withdrawal from the Society of the privilege hitherto accorded of receiving its annual consignments of seeds free of Customs Duty, was likewise submitted. The Governor-General in Council did not consider it expedient to comply with the Society's request for a continuance of the privilege, the withdrawal of which, it was intimated, would entail an annual charge of about 900 Rupees; but the Secretary of State, on a review of the case, has signified his opinion, that as such importations tend to the improvement and development of the resources of the country, they are entitled, equally with the machinery which is especially excepted from the operation of Act VII. of 1859, to exemption from the payment of Customs Duty. The Board of Revenue have accordingly been directed to instruct the Collector of Customs to exempt from payment of Customs Duty seeds imported by the Society.

---

A report from the Gardener on the germination of seeds presented to the Society during the last quarter, was placed on the table.

For all the above communications and presentations the best thanks of the Society were accorded.

---

*(Wednesday, the 16th May, 1860.)*

C. A. Cantor, Esq., Vice President, in the chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected Members:—

Messrs. Edwin Mackintosh, J. F. K. Hewitt, C. S., A. L. Agabeg, Fisk Williams, Lieutenant John Stewart, Captain A. P. W. Orr, Major W. F.

Nuthall, Messrs. E. F. Chandler, C. B. Garrett, C. S., the Secretary Local Fund Committee, Goorgaon, and the Commanding Officer, 2nd Regiment Bombay Light Cavalry.

The names of the following gentlemen were submitted as candidates for election :—

Captain W. J. Gray, Bengal Artillery, Almorah,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Dr. H. Halleur, Professor, Natural History, Presidency College,—proposed by the Reverend J. Long, seconded by Mr. J. F. Galiffe.

Peter Mackinnon, Esq., Merchant, Calcutta,—proposed by Mr. W. Haworth, seconded by the Secretary.

Captain J. Cockerell, Commanding Divisional Battalion of Police, Benares, —proposed by Mr. A. Grote, seconded by Mr. E. H. Lushington.

W. B. Buckle, Esq., C. S., Chittagong,—proposed by Mr. Charles Steer, seconded by the Secretary.

E. J. Boldero, Esq., C. S., Mynpooree,—proposed by Captain Charles Chamberlain, seconded by Dr. E. Bonavia.

Captain T. H. Chamberlain, (3rd European Regiment,) Assistant Superintendent of Thuggee,—proposed by Captain Chamberlain, seconded by Dr. Bonavia.

W. H. Pringle, Esq, Superintendent, Coal Depôt, Ompta,—proposed by Mr. C. B. Stewart, seconded by the Secretary.

Edward Fane, Esq., M. C. S., Agent to the Governor, Vizagapatam,—proposed by Captain W. Owen, seconded by Mr. W. G. Rose.

V. Roquet, Esq., Maharajgunge Factory, Azimghur,—proposed by Mr. James Smith, seconded by the Secretary.

Richard Rose, Esq, Commissariat Depôt, Doomree,—proposed by Mr. W. Cockburn, seconded by Mr. G. F. Lord.

Major J. R. McMullin, Commanding Military Police, Goruckpore,—proposed by Mr. R. Blechynden, seconded by the Secretary.

Rajah Abdool Gunny, Zemindar, Dacca,—proposed by Mr. C. E. Lance, seconded by Mr. Cantor.

Villiers Taylor, Esq., C. S., Midnapore,—proposed by Mr. H. T. Prinsep, seconded by Mr. W. H. Terry.

The following contributions were announced :—

1.—Madras Journal of Literature and Science, No. IX. Vol. V. Presented by the Madras Literary Society.

2.—Journal of the Asiatic Society of Bengal, No. 1. of 1860. Presented by the Society.

3.—A small collection of Orchids from Upper Assam. Presented by G. Wagentriber, Esq.

4.—Seeds of *Amherstia nobilis* from Moulmein. Presented by G. Buchanan, Esq.

5.—A quantity of acclimated New Orleans Cotton Seed from the Soonderbunds. Presented by Malchus Agabeg, Esq.

6.—Specimens of cocoons and raw silk from eggs of the annual worm from Moorshedabad, received from Count Freschi in August 1859, as of a diseased stock. Presented by C. S. Turnbull, Esq.

7.—Specimen cocoons reared at Umritsur from Cashmere and acclimated Cashmere stock. Presented by H. Cope, Esq.

8.—Specimen of raw silk from Tinnevelly from the monthly mulberry worm. Presented by Captain C. P. Molony, Secretary Madras Exhibition of 1860.

9.—Two bales of cotton raised at Delhi from Mexican and New Orleans seed. Presented by L. Berkeley, Esq.

(Further particulars regarding these specimens of raw silk and cotton will be found in the body of the *Proceedings.*)

Mr. Rose submitted for inspection several flower pots of various sizes manufactured in England, of an elegant design, suitable for verandahs, porticoes, and stair-cases.

*Report of Committee on certain bales of Cotton submitted to compete for the Society's Prizes.*

Read the following report of the Cotton Committee on the above subject:—

In accordance with the resolution passed at the last Monthly Meeting of the Council, your Committee have examined the bales of cotton sent in to compete for the prizes noted in the margin, and beg to report as follows:—

For the production of at least 10 mds. of good merchantable cotton raised from foreign seed of the black seeded long staple kind, Rs. 1,000 and gold medal.

For the production of at least 5 mds. of cotton raised from indigenous seed, of a quality superior to that now exported, and such as is likely to prove a substitute for the Upland Georgia or New Orleans cotton of the United States of America, Rs. 500 and gold medal.

In the first place, they regret to observe that only one party, or rather one firm, namely, Messrs. Fischer and Co., of Salem, in the Madras Presidency, have entered as competitors for these premiums. This firm, as will be seen from their letter appended to this report, have submitted 3 bales containing 900 lbs. of raw cotton raised from Bourbon seed, to compete for the first

named prize of Rs. 1,000 and the gold medal; and 2 bales containing 494 lbs. of Oopum cotton to compete for the second prize of Rs. 500 and gold medal.

Your Committee have no hesitation in offering their opinion that the Bourbon cotton now submitted is a "good merchantable cotton," and entitled to the premium offered for the production of at least 10 maunds of such cotton raised from foreign seed of the black seeded long staple kind. They are also of opinion that the Oopum cotton does not meet the necessary requirement, *viz.*, a "substitute for the Upland Georgia or New Orleans cotton of the United States of America." But to test this point fully, they beg to recommend that the bales be sent to the "Cotton Supply Association" at Manchester for their opinion and report, and that, in the event of their report coinciding with your Committee's, the cotton be sold and the proceeds carried to Messrs. Fischer's credit. They would also further recommend that the Bourbon cotton be sent to the same Association for sale, and that the proceeds of such sale, with a report on the quality of the cotton, be communicated in due course to the Society.

The Committee beg to add that Messrs. Fischer have submitted, as required by the conditions, a statement of the mode of cultivation and cost of the above kinds of cotton, but as there are one or two points in it which appear to the Committee to be obscure, they recommend its return for these points to be clearly established.

Though not referred to them the Committee have had before them a letter from Mr. Malchus Agabeg, (received by the Secretary since the last Council Meeting,) forwarding a quantity of clean cotton raised in the Soonderbunds from New Orleans seed, and requesting to be informed if it could be allowed to compete for the prize. Even if this cotton had not been received after the time fixed, it could not enter the list for competition for the first prize, as it is not a black seeded long staple kind; and of course it could not be brought into competition with indigenous cotton.

(Signed) C. A. CANTOR.
" H. A. HURST.
" M. RUSTOMJEE.

CALCUTTA,
30*th April*, 1860.

*Resolved*, on the recommendation of the Council, that this report be adopted, but that Messrs. Fischer and Co.'s sanction be previously obtained to the transmission of the bales of Oopum cotton, and that Mr. Agabeg's

cotton, should he desire it, be forwarded by the same opportunity. Further, that the kind offer of a Member of the Committee (Mr. Hurst), whose firm has been lately appointed Honorary Agents for India of the Manchester Cotton Supply Association, to undertake the transmission of these bales, be accepted with best thanks.

The following is Mr. Agabeg's letter referred to in the Committee's Report:—

"The Council of your Society I believe some time back offered a premium of Rupees 500 and a gold medal to any one who should, before the expiration of 31st December last, produce in this country five maunds of good cotton from the New Orleans cotton seed.

"Although the period above specified has long since passed, yet I trust your Council may be induced to extend the time to the end of the present month, in consideration of the great interest that at present exists, both in this country and in England, as to the possibility of producing in Her Majesty's Indian dominions a supply of this staple adapted to English manufacturing purposes, and equal to that of foreign growth. At all events I beg to forward to you ten bags of cotton raised in the Soonderbunds from New Orleans cotton seed, by my late brother, Mr. K. Agabeg, and will be obliged by your kindly placing this letter before your Council for their consideration."

In connection with this subject, the Secretary read extracts of letters from Mr. L. Berkeley of Delhi, sending down two bales of cotton raised from Mexican and New Orleans seed, small samples of which were previously submitted, and so favourably reported on at the General Meeting in February last.

In one letter Mr. Berkeley writes:—"This cotton was cleaned with the common Indian churka, and being the first trial may not be so perfect as desired; but it is proved that every description of American cotton will grow in India. I could arrange for any quantity being grown here, provided a purchaser was obtained on the spot. The natives, particularly cultivators in this district, will not grow it and undertake the trouble and hazard of its transit to Calcutta. * * * * The seed which I obtained from the New Orleans and Mexican plants has been distributed in this, the Dehra and Juggar districts."

In a second letter Mr. Berkeley remarks—"The expense of growing American cotton will prevent its being introduced, unless Government take it in hand or some large company who can induce the natives to grow it and

buy it from them on the spot. The lands in this district are admirably adapted for cotton, but the landholders refuse to cultivate it, as they say they cannot get a better sale for it than their own cotton."

*Resolved*—That these two bales be also transferred to Messrs. Mosely and Hurst for despatch to the Cotton Supply Association.

Read the following letter from Mr. Malchus Agabeg, reporting on his trial of the Society's Cottage Saw Gin :—

"I return herewith the Cottage Hand Gin I borrowed from you some time back, and beg you will do me the favour to convey my best thanks to the Council of the Society for their kind accommodation.

"The Cottage Hand Gin is well adapted for the cleaning of all short staple cotton, and if properly worked, it ought, in my opinion, to turn out one maund of cotton per day. I cannot, however, recommend this machine for the long staple cotton, as from experiments made with the Sea Island Cotton, I found the fibres of the staple were in a great measure destroyed.

"I also send for the use of the Society a few bags of the New Orleans seed raised in the Soonderbunds."

SILK.

Read the following letter from Mr. C. S. Turnbull, Manager of the Radnagore silk filatures, dated 16th April, forwarding the cocoon and skeins of raw silk alluded to under the head of contributions:—

"I beg to report on the silk-worm eggs of the Moorshedabad district, said to be diseased, by Count Freschi, and sent by the Society in April last for rearing and reporting thereon.

"I am sorry to say most of the eggs were destroyed by insects through the carelessness of the rearer, but the rest ALL hatched, and showed no symptoms of disease at any of the stages, nor did any die. I send you some of the cocoons and silk reeled therefrom, which will speak for themselves. All I can say is, I have no such cocoons in this district to come near to them, except the *Boro poolo.*"

This silk was considered by the Meeting a good merchantable article.

Read a letter from Mr. H. Cope, of Umritsur, dated 16th April.

"My silk season is drawing to a close, and I hope soon to be able to send you a more detailed report than I can manage to prepare at present of my somewhat extensive operations. I may mention, in the mean time, that the space I have occupied, about 60 yards by 15, in four different locations, with double and triple rows, and in one instance, quadruple, with five stages, may give the Society some idea of their proportion. The number of baskets is about 700. In six days more every worm will have spun. I send you, by

this day's Dâk Baughy, two large samples, picked at random, from my stock. One of cocoons from acclimated eggs of my last year's rearing, and the second of cocoons from eggs obtained from Cashmere direct."

The Secretary mentioned that Mr. Turnbull had obligingly reeled these cocoons, and he now submitted two small skeins of raw silk, received with the following letter from that gentleman, dated Ghuttal, 7th May :—

"Yours of 2nd with the Baughy parcel containing cocoons sent by Mr. Cope are safe to hand.

"The cocoons themselves are not quite so good as those sent last year. You must have observed how uneven and small some were. I give the preference to the Cashmere cocoon. The silk of the acclimatized is however of the deepest colour, and those cocoons reeled the best. I think it needless to say more, as I gave my opinion on the subject on a former occasion.

"I send you a cocoon of each of the above taken indiscriminately with one reared here from the eggs sent by Mr. Cope. Mine is better than the acclimatised, and not so good as the Cashmere."

This silk was much admired by the Members present as of first rate quality, being very fine, bright colour, and good thread. It was considered that if the production could be extended, it would be a favourite silk in the English market.

Read a letter from Captain Molony, enclosing one from the Collector of Tinnevelly, giving the information applied for by the Society, as by a resolution passed at the January Meeting, and enclosing a sample of raw silk from the monthly mulberry worm. This silk is considered by a Member of the Committee (Mr. W. G. Rose) to be of very inferior quality, having more the appearance of vegetable than animal fibre; it has been very badly reeled, if it had been properly reeled, it would be worth more than double its present value.

Submitted a letter from Captain Thomas Hutton, enclosing copy of his report to Government respecting the failure of his experiments with the *Bombyx Huttoni*, and other letters on the subject of silk culture in the Himalaya.

Submitted a letter from Mr. Cope, enclosing translation of a letter from Monsieur Perottet, respecting certain kinds of silk-worms reared from eggs sent to Pondicherry by Mr. Cope.

The above communications from Captains Molony and Hutton, and Mr. Cope, were transferred to the Committee of Papers.

A letter was read from Mr. C. K. Hudson at Cherra, applying for grafts of English fruit trees, as also ornamental plants. Mr. Hudson also refers to the introduction of the Madras potato and the failure of the California kind, which the Society introduced a few years ago, and to his attempts at tea culture. "The Government has sent up a quantity of Madras potato seed this year for distribution to the Cossiahs, and I hope we shall now have a better stock of this vegetable. If they turn out well, I will send you a specimen of them. The California potatoes deteriorated very soon, and the people have given up growing them, as they were very watery and insipid, and quite unsaleable. I am trying to grow tea at Cherra, but I fear there is too much rain for it; some seedlings I planted out last year, just before the rains, stood out bravely, but they were nipped by the frost in December and January, and became stunted. They seem, however, to be recovering now, and if they stand out this rainy season, I think I may calculate on success. The Assam plants seem stronger and healthier than the China plants."

For all the above communications and presentations the best thanks of the Society were accorded.

---

*(Wednesday, the* 13*th June* 1860.*)*

C. A. Cantor, Esq., Vice President, in the Chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected Members:—

Capt. W. J. Gray, Dr. H. Halleur, Capt. J. Cockerell, Messrs. Peter Mackinnon, W. B. Buckle, C. S., E. J. Boldero, C. S., Capt. T. H. Chamberlain, Messrs. W. H. Pringle, Edward Fane, M. C. S., V. Roquet, Richard Rose, Villiers Taylor, C. S., Major J. R. McMullin, and Kajeh Abdool Gunny.

The names of the following gentlemen were submitted as candidates for election:—

Capt. E. H. C. Wintle, late 61st Regiment, N. I.,—proposed by Mr. C. A. Cantor, seconded by the Secretary.

W. Halsey, Esq., C. S., Calcutta,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

Capt. R. D'O. C. Bracken, 2nd in Command, 5th Punjab Infantry,—proposed by Mr. F. Reid, seconded by the Secretary.

Lieut. Alfred Dixon, Bengal Horse Artillery, Benares,—proposed by Sir. R. DeL. St. George, Bart., seconded by Mr. E. F. Lautour.

Major H. T. Macpherson (82nd Foot), Commanding 1st Gwalior Infantry, Gwalior,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Dr. R. F. Hutchinson, Civil Surgeon, Arrah,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

John Peter Grant, Junior, Esq., C. S., Serampore,—proposed by Mr. Grote, seconded by Dr. Thomson.

Colonel D. Rainier, H. M. 98th Foot, Peshawur,—proposed by Mr. C. A. Cantor, seconded by Mr. W. G. Rose.

Lieut. W. F. Badgley, 18th Punjab Infantry, Gonda, Oude,—proposed by Capt. James Williamson, seconded by the Secretary.

A. H. Hilson, Esq., M. D., 18th Punjab Infantry,—proposed by Capt. Williamson, seconded by the Secretary.

The Hon'ble G. W. Edwards, Governor of Labuan,—proposed by Dr. Thomson, seconded by Mr. Grote.

Dr. J. Davis, Civil Surgeon, Bassein,—proposed by Major A. Fytche, seconded by Mr. C. A. Cantor.

Capt. H. E. Read (late) 50th N. I., Roorkee,—proposed by Capt. W. E. Morton, seconded by Capt. A. D. Turnbull.

Lieut. C. S. Thomason, H. M. Bengal Engineers, Roorkee,—proposed by Capt. Morton, seconded by Capt. Turnbull.

The following contributions were announced :—

1.—Selections from the Records, Government of Bengal, Nos. 32 and 33. Presented by Government.

2.—Journal Asiatic Society of Bengal, No. V. of 1858. Presented by the Society.

3.—Annales de l'Agriculture des Colonies et des Regions Tropicales, Nos. 1, 2, and 3, 1860.

4.—Selections from Papers on Indigo cultivation in Lower Bengal, No. 2, by *A Ryot.*

5.—A quantity of acclimated cauliflower seed from Lucknow. Presented by Dr. E. Bonavia.

6.—A small quantity of acclimated beet and carrot seed from Delhi. Presented by L. Berkeley, Esq.

"The carrots were raised," writes Mr. Berkeley, "in March, 1859, and lived out the hot season. In July last I took them up, cut their roots, and placed them in a bed where they seeded freely. I am in great hopes this seed will turn out well. If it should, there will be no difficulty in obtaining it yearly in the same way."

7. A specimen of tar from teak wood and of oil from the Bela nut. Presented by R. A. Sterndale, Esq.

It was agreed that Mr. Sterndale be requested to give additional particulars respecting this tar, the cost of production, the rate at which it is sold, &c.

8. A muster of cotton raised in Arracan from Sea Island seed. Presented by A. W. Roghé, Esq.

Mr. Roghé gives the following particulars respecting the cultivation of this cotton in a letter dated Akyab, 16th May:—

"In December last I received some Sea Island cotton and some Cuba tobacco seeds from America. I prepared some beds in a sandy soil, manured with horse dung, and situated about half a mile from the sea beach. This was in the beginning of January, when I put both the seeds into the ground, and I think that it was about 2 to 2½ months later than what it ought to have been.

"The *cotton* I planted at the same time as the tobacco, and after the plants had grown to the height of about 4 inches, I transplanted the greater part of them, leaving some plants in the bed. Unfortunately the transplanted plants were destroyed by some goats which jumped into the enclosure, but the plants which remained in the bed were preserved, grew up well, flowered, and since about a fortnight the pods have begun to open. They have, however, the peculiarity that they do not open fully, and the cotton with the seed does not expand, but remains in the pod, which is divided into four parts, each part containing some cotton with seed. I send a small sample of the cotton and the seed in this letter, and you will find that it has got a long thread, and is very silky, in fact, of very good quality; and it would be white also if it had not been raining very often whilst the pods were opening. The proportion of the cotton and the seed is 1 part cotton and 3 parts seeds, which I believe is very unfavourable, and it appears to me that the seeds are considerably larger than those which I received from America. This may be owing partly to having sown the seed in January, whilst it ought to have been sown in October or November, and to this I attribute also that the cotton has not expanded when the pods opened. Then it is to be considered that it was planted in a sandy soil which had no other nourishment but the manure of horse dung, neither sand nor horse dung being suited for the plants.

"Upon the whole I am well satisfied with the experiment, and intend to try it on a larger scale in a clayey soil next season, when I hope to obtain better results."

This cotton is one of the best that has been submitted to the Society, the produce of foreign seed. Mr. Hurst (a Member of the Committee) reports on it as "a most valuable long-stapled cotton, slightly stained in colour, owing doubtless to its being gathered in wet weather; still it would fetch about two shillings per pound. This quality is chiefly used for spinning fine thread adapted for the English market."

The Secretary mentioned that he had requested Mr. Roghé to oblige the Society with the result of his proposed extended experiments, the cost of production, &c.

9. Eight specimens of Wood from Port Blair, Andamans. Presented by the Government of India.

10. A section of Himalayan Box wood. Presented by Lieutenant J. F. Pogson.

(Further particulars respecting these woods will be found in the body of the *Proceedings.*)

11. A few Narcissus bulbs from a batch just received from Simla. Presented by Mr. J. Manuel.

---

*Report of Committee on certain kinds of Wood submitted to compete for the Society's prize for an efficient substitute for Europe Box for engraving purposes.*

A Report was submitted from the Special Committee appointed to enquire into the above subject. The Committee, after full consideration, have agreed to the recommendation that the prize of Rs. 500 and gold medal be awarded to Captain W. G. Hay for the logs of Himalayan Box which he has sent down; and that in consideration of the valuable information communicated by Mr. George Jephson, and of the expense and trouble to which he was put by the Society's second reference, a premium of the same value (Rs. 500) be awarded to that gentleman.

*Resolved,* on the recommendation of the Council, that the Report of the Committee be adopted.

In connection with this subject a letter was read from Dr. Alexander Hunter, Secretary of the School of Industrial Arts at Madras, reporting very favourably on a portion of Captain Hay's Himalayan Box, which was sent to him by the Society, and forwarding proofs of wood-cuts executed upon it: also from Lieut. Pogson, giving a few particulars respecting the section of Box wood which he has sent down; when it was *resolved* that the above communications, as also those from Mr. Jephson, Captain Hay, and the reports of Mr. Whitly, of the Calcutta School of Industrial Arts, be transferred to the Committee of Papers for publication in the *Journal.*

A Report was read from the Manchester Cotton Supply Association on certain samples of cotton which were submitted at the February Meeting, and likewise reported on by the local Committee. Agreed, that this be published in the *Journal* with the Committee's Report.

---

*Artificial Irrigation by Windmill power.*

Read the following extract of a letter from Mr. R. W. Bingham, of Chynepore, near Sasseram, dated 18th May, in continuation of his remarks on the same subject submitted at the February Meeting:—

"Respecting pumps for irrigation purposes worked by windmill power as suggested by me, I made the same suggestion to my correspondent in Manchester, who referred the matter to Messrs. Burgess and Key, and Messrs. Fowler and Co., of London, practical engineers, and they write as follows:—

The former says—"We think a small wind apparatus to drive a 2½-inch pump, which would raise water at the required height (30 or 40 feet), at the rate of 250 gallons per hour, would be a very simple and durable arrangement. In the event of your friend ordering, we should require to know the position of the pump, and also the length of delivery and suction pipe—price £95, without suction or delivery." Well, that at all events would be useless; it is evident these gentlemen do not understand the necessities of irrigation. An orthodox leathern bucket, pair of bullocks, and rope would deliver 250 gallons per hour. It might be a pretty machine, but would not meet our requirements. Two hundred and fifty gallons a minute, night and day, would be much more to the purpose.

Messrs. B. Fowler and Co. say—"We really hardly know what to recommend suitable to horizontal windmill power with chain pump attached. We are making some experiments in chain pumps, result of which we will let you know. Meanwhile, I cannot recommend you any thing better than our numbers 74 and 75 pump, which is suitable for working either by horse or bullock gear. It is an excellent pump; we are at this moment *making several for windmill gear for shipment to Adelaide.* They are very simple and easily rigged and managed. If your correspondent will send us a sketch of such as he has seen in use, we would readily furnish similar work, and with pleasure hand quotations." Yes, that is easily said, but there are none at work that I know of in India. Perhaps some Hollander might have an idea of those in use for draining the swamps of his country, but I still think the idea is a feasible one, and shall not fail to let you know the result of any further information I may get from my friend on the subject. In the mean time I may state that the pumps alluded to by Messrs. B. Fowler and Co., as Nos. 74 and

75, are Holman's double action pumps: and a 3-inch barrel with 12-inch stroke with brass internal barrel and spur gear will at 40 strokes per minute deliver 1,200 gallons per hour, and costs £31-10-0, and the same with 6-inch barrel and 18-inch stroke delivers at 40 strokes per minute 8,500 gallons per hour, and costs with spur gear £50-0-0. This would be a valuable irrigation pump, but still wants windmill power, as steam power is far too expensive for the Mofussil. I hope we shall come to some solution soon. I shall await with anxiety Messrs. Fowler's promised further communications, as they are fitting up their pumps for Adelaide to work with windmill gear. The Adelaide people at all events are getting the start of us in irrigation: and if they can use windmill pumps, why not we? At all events, without something of the kind, any great extension of cotton planting in the Mofussil will be almost impossible."

---

Letters were also submitted.

1. From Secretary, Government of India, forwarding eight specimens of wood from the Andamans, and requesting that a report on their properties for ship and house building may be obtained.

The Secretary read reports from Messrs. Mackintosh, Burn, and Co., Shearwood and Co., and the Builder and Surveyor, Marine Department, on the above specimens. *Ordered,* that copies be sent to Government, and that the information applied for in these reports be solicited, in addition to the information previously requested by the Society.

2. From D. Simson, Esq., Commissioner and Superintendent, Baraitch Division, Oude, applying for seeds for public gardens about to be established in the districts of Fyzabad, Gonda, and Baraitch. *Ordered,* that seeds for the kitchen and flower gardens be supplied at cost price, and seeds of field crops gratuitously, and that any other assistance in the power of the Society, that may be required, be rendered.

3. From Messrs. Fischer and Co., of Salem, tendering their acknowledgments for the prize for cotton awarded them by the Society, and acceding to the Society's proposal for the transmission of the bales of Oopum cotton for sale in the English market.

4. From R. W. Bingham, Esq., an interesting paper entitled—"A few remarks on canals for India,—primarily for irrigation, but principally regarding their advantages in Shahabad and Behar, and in the districts of Benares and Ghazeepore, south of the Ganges." Referred to the Committee of Papers.

For all the above communications and donations, the best thanks of the Society were accorded.

*(Wednesday, the 11th July 1860.)*

C. A. Cantor, Esq., Vice President, in the Chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected Members :—

Capt. E. H. C. Wintle, Capt. R. D'O. C. Bracken, Lieut. Alfred Dixon, Major H. T. Macpherson, Dr. R. F. Hutchinson, Messrs. W. Halsey, C. S., J. P. Grant, Jr., C. S., Col. D. Rainier, Lieut. W. F. Badgley, Dr. A. H. Hilson, the Hon'ble G. W. Edwards, Dr. J. Davis, Capt. H. E. Read, and Lieut. C. S. Thomason,

The names of the following gentlemen were submitted as candidates for election :—

Major H. M. Wilson, Commanding Hill Rangers, Bhaugulpore,—proposed by Mr. Thomas Wilson, seconded by the Secretary.

H. W. Dashwood, Esq , C. S , Banda,—proposed by Mr. C. A. Cantor, seconded by Mr. S. P. Griffiths.

John Parker, Esq., Architect, Burdwan,—proposed by Mr. W. H. Pringle, seconded by the Secretary.

C. Moyne, Esq., Silk Filatures, Jungypore,—proposed by Mr. W. G. Rose, seconded by Mr. Griffiths.

Capt. J. L. Nation, Commanding 9th Police Battalion, Chota Nagpore,—proposed by Col. Hannyngton, seconded by Mr. Cantor.

The Secretary, Public Garden, Cawnpore,—proposed by the Secretary, seconded by Mr. Rose.

Capt. W. N. Lees, LLD., Calcutta,—proposed by Mr. A. Grote, seconded by Mr. Cantor.

W. M. Whitney, Esq., Merchant, Calcutta,—proposed by Mr. Griffiths, seconded by Mr. C. E. Cresnell.

Dr. John Squire, 3rd Seikh Infantry, Goruckpore,—proposed by Major J. R. McMullin, seconded by the Secretary.

W. Money, Esq., Barrister-at-Law,—proposed by Mr. A. Grote, seconded by Dr. Thomson.

T. E. Wilson, Esq., District Engineer, E. I. Railway, Soorool,—proposed by Capt. F S. Stanton, seconded by Capt. C. H. Dickens.

Dr. A. J. Payne, Medical Service, Calcutta,—proposed by Mr. F. Beaufort, seconded by the Secretary.

The Rajah of Bobily, Vizagapatam,—proposed by Capt. W. G. Owen, seconded by Mr. Edward Fane.

Charles H. Wilson, Esq., Calcutta,—proposed by Mr. Cantor, seconded by the Secretary.

Capt. C. C. Drury, late 34th B. N. I.,—proposed by Mr. R. F. Ross, seconded by the Secretary.

Capt. F. Lukin, Paymaster, 2nd Dragoon Guards, Lucknow,—proposed by Mr. P. Carnegy, seconded by Mr. Cantor.

The following contributions were announced :—

1.—General Report on the Administration of the several Presidencies and Provinces of British India, during 1858-59, (3 volumes). Presented by the Government of Bengal.

2.—The Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. 17, part 2. Presented by the Society.

3.—Two healthy plants, in flower, of perennial Phlox. Presented by S. P. Griffiths, Esq.

4.—Two samples of tea raised and manufactured at Chittagong. Presented by Capt. A. Fryer. This tea has been imperfectly manufactured and is out of condition, but otherwise encouraging for an extension of cultivation.

5.—A small specimen of raw silk raised at, and reeled by Jaffer Alee, of Goordaspore, in the Punjab. Presented by H. Cope, Esq.

Mr. Cope submits this specimen with the view of ascertaining whether there is any improvement in the reeling over the samples submitted in 1858, when the Society's silver medal was awarded to Jaffer Alee, as the first zemindaree planter of mulberry trees in the Punjab, for rearing silk worms. This silk is valued at 15 shillings per lb. at Umritsur.

Mr. Buskins (of Messrs. W. Moran and Co.) considers that, "as compared with the old musters, there is a slight improvement observable in this skein, the thread being more even in size and more round: it is, however, far from even and is very foul. If made a little cleaner, and reeled the same length as a Bengal skein, the silk would be very desirable, and would meet with ready sale here. It is worth 14 shillings to 14*s.* 6*d.* per lb. in England."

6.—Samples of sugar prepared from Imphee plants grown in the Burdwan Jail, under the superintendence of Mr. Cantopher, the jailor. Submitted by the Board of Revenue.

The following is extract of Mr. Cantopher's letter to the Magistrate of Burdwan :—

"Ten seers of juice were extracted by means of a common "charkhee" out of about 850 small and large plants, to which 6 chittacks of "goor" from the bazar were added; this produced 1 seer 2½ chittacks of good refined sugar-candy, 1 chittack of white sugar, 2½ chittacks of brown

sugar, and 6 seers of treacle. The cost in the process has been only eight annas and nine pie. I felt at first rather discouraged in finding the juice discoloured and rather acid both to the smell and taste, but on adding to it the bazar goor and making the whole quantity undergo a few other processes, a change immediately took place with the results above mentioned."

The Secretary read the following report on the above specimens obligingly furnished by Mr. S. H. Robinson, a member of the Sugar Committee:—

"I am sorry I cannot arrive at a favourable conclusion on this experiment, and I doubt if any crystallizable sugar *at all* has been produced from the Imphee.

"Mr. Cantopher says, that there were submitted to operation

| | Srs. | Chks. |
|---|---|---|
| Goor from the bazar ... ... ... | 0 | 6 |
| Imphee Juice ... ... ... | 10 | 0 |
| Total ... ... | 10 | 6 |

And that this produced

| | Srs. | Chks. |
|---|---|---|
| Sugar Candy ... ... ... | 1 | 2½ |
| White Sugar ... ... ... ... | 0 | 1 |
| Brown Sugar ... ... ... ... | 0 | 2½ |
| Treacle ... ... ... ... | 6 | 0 |
| Total ... ... | 7 | 6 |

"The Candy is of a good strong crystal, though not so hard and free as sugar-cane candy, and the white and brown sugars show no traces of crystallization at all, but are pasty and more of the consistency of grape sugar.

"If the 'goor' which Mr. Cantopher got from the bazar, was of the ordinary strong crystallized kind grown in Burdwan and deprived of its molasses, the 6 chittacks of it might suffice, if skilfully worked, to give the degree of crystallization apparent in the 1 seer 2½ chittacks of candy.

"The produce of the Imphee would then appear to be:

| | Srs. | Chks. | Srs. | Chks. |
|---|---|---|---|---|
| Candy ... ... ... ... | 1 | 2 | | |
| Less Goor ... ... ... | 0 | 6 | | |
| | | | 0 | 12 |
| White Sugar ... ... ... ... | | | 0 | 1 |
| Brown do. ... ... ... ... | | | 0 | 2½ |
| Treacle ... ... ... ... | | | 6 | 0 |
| Total ... ... | | | 6 | 15½ |

"No sample of the treacle is sent, but as the above shows the total product from the 10 seers of juice to be nearly 70 per cent., the treacle is probably very thin and watery.

"I do not think any satisfactory conclusion can be come to as to the value of the Imphee, unless the juice from it be worked alone without any aid from cane or other sugar. If it will not crystallize without such aid, it can hardly be worth cultivating as a sugar-yielding plant."

7.—Samples of cotton raised in the Dharaseo district (Hydrabad Assigned Districts) from imported New Orleans and Egyptian seed, and from acclimatized Egyptian seed. Submitted by the Government of India. (Referred to the Cotton Committee.)

8.—Seeds of the "Palmiste" of Bourbon, of Avagodo pear, of a very pretty Ipomæa, and soil of the Island. Presented by Capt. W. H. Lowther. (Further particulars respecting these seeds will be found in the body of the Proceedings.)

*Nursery Garden.*

A report was submitted from the Garden Committee intimating the completion of most of the work recommended in a previous report in respect to the repairing of old roads, forming of new ones, and additions to the gardener's bungalow. The Committee suggest the erection of pucka buildings in place of the present sheds for housing of glazed cases and the large collection of tools recently received from England. They further recommend, with reference to recent considerable alterations in the flower garden, that the conservatory be removed from its present site to the western boundary of the garden, and that an attempt be made to substitute iron pillars for wooden posts. The Committee submit a general report from the gardener, entering into various details for proposed improvements in the laying out of certain parts of the garden, for making the staff of native gardeners more efficient by adding to the number, and increasing the present rate of wages, and for carrying out certain details of garden work, such as layering, grafting, &c., in a different manner than hitherto pursued. The gardener complains of the difficulty he has recently found in obtaining efficient labourers; this has prevented the completion of certain work which would otherwise have been finished before the commencement of the rainy season, and has retarded general operations. The Committee add that they have taken the various suggestions of the gardener into consideration and recommend their adoption, as they conceive they are likely to tend in every way to the improvement of the garden.

*Resolved*, on the recommendation of the Council, that the Committee's report be adopted.

*Artificial Irrigation by Windmill power.*

The Secretary submitted the following remarks from Captain John Eliot, Executive Engineer, Barrackpore, in reference to the observations of Mr. R. W. Bingham, of Chynepore, which were laid before the last Monthly Meeting:—

"I notice Mr. Bingham's application about power and pumping for irrigation. His requirements are, I gather, 250 gallons lifted 40 feet per minute $250 \times 60 \times 24 = 360{,}000$ gallons in a day; $360{,}000 \times 40 \div 4{,}752{,}000$ horse power required, and that is 3; double this for friction, &c., and a 6-horse-power engine will raise the water; but he does not want a steam engine, and for India, I think, he is right. You can't send to the nearest village for a skilled mechanic, or at all events if you do, you are not likely to get one, and I would recommend his applying to Mr. J. R. Peill, 17, New Park Street, Southwark, for an estimate of the cost of one of Jahn's patent self-regulating wind engines. I believe he makes them up to 10 and 12-horse power, and they appeared to me simple and effective, but I think he had better have an 8-inch barrel with 20-inch stroke, without spur gear, as I calculate in from 35 to 40 revolutions a minute would cost, with an iron barrel, £32, or with brass internal barrel, £40. Holman's pumps are very simple and good, but it is doubtful whether they are equal to a 40-feet lift. I saw one at work at a low lift in England, about 12 or 15 feet, and I think the owner told me it was excellent, and all he could wish at that, but he doubted its working so well at long lifts."

*State of Horticulture in the Island of Bourbon.*

The Secretary submitted several letters from Capt. W. H. Lowther, temporarily residing at Bourbon, giving information respecting various subjects of Horticultural interest which he has met with on the Island. The following are extracts from these letters, relating more particularly to certain seeds and plants, some of which have been received and others promised:—

"I am preparing for despatch to your address a package or two, which you will, I hope, receive safely.

"1. A sack of seeds of the famous Palm "*Palmiste* of Bourbon," furnishing one of the favourite esculents of the island. It is a very delicious vegetable, resembling asparagus in flavour, and of which I will tell you more by and bye. It ought most certainly to thrive in Bengal, especially towards the low hills, sheltered from frost, which I hardly think it would encounter with impunity.

"2. A bottle of the celebrated "Palmiste" Pickle.

"3. A tin case containing a quantity of seeds of the famous Bourbon Alligator Pear, supposed to be the finest kind known, and which is *grafted* here in preference to propagation by other methods.

"4. The same case contains the Earth of the island,—entirely volcanic and ferruginous, and which I forward for analysis as being of probable value to the growers of Cane, Vanilla, Tea, Tobacco, Coffee, Cloves, Nutmegs, Chocolate, &c., &c., all which here attain the greatest perfection. Enormous quantities of guano are annually imported to meet the exhaustion of the bountiful soil, but this of course applies only to the cane, which cultivation almost exclusively occupies the capitalist, as affording an immediate return on outlay, and to the very great detriment of general prosperity and the subsistence of a superabundant population.

"5. *Vanilla* pods from the largest plantation in the island, and of which the owner has peculiar and secret modes of preparation, the curing consisting in an artificial process of ripening after gathering. He is a very scientific man, of great travel and investigation, and has recounted to me his experiments in the fecundation of the blossoms, and which he in vain sought to obtain *naturally*. This process, as you know, in all other parts of the world, except South America, devolves on the gardener. Your Calcutta method of cultivation will never succeed, and I am only surprised you have a single plant alive. HERE, even in one of the finest climates of the world, it requires a dense shade, and whenever grown on trellises, small woods of quick-growing trees are planted all about the gardens with rivulets of water running below to keep up the requisite moisture, but without doubt, and in accordance with the opinion of my experienced friend, the finest "Vanilla" pods, as well as the more *fruitful* plants, are alone to be found upon large trees,—such being the primitive and natural state of the climber in its native woods of Brazil. But I shall write to you more fully on the subject when I have made the tour of the island and seen everything.

"I have in vain tried to get you seeds of the curious and handsome palm of Cayenne, the trees are all of late introduction, and have not yet borne fruit. There is a handsome group of them in the Church Square.

"I hope to get several kinds of useful and ornamental seeds in time for this opportunity The *Sarsaparilla* is of a very superior kind—wild, abundant, and the Negro earns his living by occasionally digging and selling the roots,—I hope to get seeds of it. I enclose the seeds of a pretty *Ipomœa* with Palmate foliage, which I saw in the Government Garden, it is somewhat like *Ipomœa dissecta*.

"*Bougainvillæa* here attains its greatest perfection, as indeed does almost everything requiring a warm and equal temperature; up above in the cooler region everything European is to be found. It is a most enjoyable climate and being so near India, ought to be better known. I shall run over to Mauritius before the fine season is finished, but by all accounts the climate and country is in every way inferior to this island. The Beans or *Haricots* here form a principal-dish of the tables of both rich and poor, the ripe seeds being cooked exactly in the same manner as our different kinds of *dhâl* in India. To my taste these are all very delicious as well as being highly nutritious, and I have begun making a collection of them for transmission. They would all be of great value to the Hindoos, especally during famine. Our lower hills, for most of them, would be the kind of climate, and for others the Dhoon and Mussouree Hills would be better. I will try and send you some coffee of the better kinds. The price of the berry has risen very high in consequence of so little being grown, and indeed many old plantations were cut down during the Sugar Cane mania to obtain ground for the more favoured cultivation.

"I have also set about getting you an entire bunch of the ripe fructification of the "*Morfla*" Palm. Just fancy a raceme from 10 to 20 feet long covered with at least a thousand brilliantly shining cones, like those of a fir, a noble object of ornament.

"I saw the seeds of "*Simaruba Quassia*" (a lovely as well as useful tree) appearing in the garden and am promised that too by Richard, as well as anything else I fancy. I also found quite ripe plentiful berries of a pretty shrub from Madagascar (in *Rubiaceæ*). I have received a most pressing invitation to visit a large landed proprietor in the interior who is enthusiastic in plants and their properties, and has a fine collection, both living and dry. He has promised to give me the whole of the processes as practised here in the unrivalled Vanilla and Tobacco Plantations, and to assist me in my researches. I have been in the finest *Vanillerie* on the island. Out-turn this season 80,000 rupees, in consequence of South American crop having failed; the little coffee I have got as yet I have sent off with other seeds to Assam. I have letters to a large landed proprietor who owns all the Tea on the mountains, and which for the last 17 years has self-sowed itself all over the fine volcanic slopes unheeded and uncared for. I saw the China plant in full vigour down here in the Government Garden. The bundles of *Vanilla* I saw at the estate were frosted in the most beautiful manner with snowy acicular crystals, and, as specimens, were probably unsurpassed in the world. Two pods I

extracted therefrom have rendered my room unpleasantly fragrant, the strength is very very far above the product of our garden. I am promised a fine sample and have not therefore sent you the few pods I possess, and which are said to be second-rate. The *Rose de Malmaison* is in its full bloom and beauty just now in nearly every garden, but more especially on the hills just above the town. And the *Azaleas* are also in blossom, very lovely indeed, but *Camellias* only thrive at a great elevation, and are brought down occasionally in the bouquets for sale."

*Communications on various subjects.*

The following papers were likewise submitted :—

1. From C. U. Aitchison, Esquire, Under Secretary, Government of India, submitting a communication from the Resident at Hydrabad on the result of trials made in the culture of exotic cotton in the Hydrabad Assigned Districts. (Transferred for publication in the *Journal.*)

2. From Geo. E. Evans, Esq., Analytical Chemist, Museum of Economic Geology, reporting on the sample of teak tar received from Mr. R. A. Sterndale, of Seonee, which was laid before the last meeting :—

"I have examined the Wood Tar you sent me, and I find that it contains all the ingredients to be found in Coal Tar, but in different proportions relatively to each other.

"I am of opinion, that if used in every way in which Coal Tar is made available, its effects would be much less permanent than the former, particularly if exposed to the action of the atmosphere, but this could only be proved by actual experiment, and by noticing its effects for a length of time.

"I am convinced that it might be rendered much more valuable by concentration, say, by exposure to the sun's rays for a short time in large evaporating pans, as it would then part with a large amount of watery vapour, which it contains in a free state.

"I should like to hear from you again upon the subject, with reference to the cost of manufacture, &c., as I have no doubt the investigation would prove valuable."

3. From Lewis Cosserat, Esq., of Burhogah, viâ Sewan, a few remarks respecting the cultivation of *Lucerne* :—

"With regard to seeds for field crops and the quantity of land I would put in, I am at a loss how to reply, not knowing to what extent these seeds may be available, but I annex a list of the acres of each that I should like to cultivate, and though of course content with smaller quantities as a means of raising acclimated seed, I would remark that smaller

quantities of land than ¼ of an acre are not so likely to yield very correct practical results. Small patches in gardens cannot, I think, possibly afford accurate information regarding field crops intended to be grown on a large scale. I would particularly wish for the trefoil as it and a native trefoil "*Merwaireah*" with a yellow flower, grows excellently in this part of the country, both form valuable fodder in a country where there is really speaking no good grazing. The *Lucerne* gives several cuttings during the year, and left to itself flowers in May; I have a little now from acclimated seed, the stalks are 3 feet high, and though run to wood are eagerly devoured by my horses and horned cattle, the former are particularly fond of it, and cows give a better yield of milk upon it. A few acres of this grass would be invaluable to me here where a bundle of *Dhoob* grass is scarcely obtainable for a couple of months prior to the opening out of the rainy season. The *Lucerne* I have was from a few seeds that I obtained from the late Major Holmes's farm at Segowly. I have now about the 20th of a beegah; it was sown in line in beds in October, and afterwards thinned out and the overplus transplanted. The plants take root freely, and though a watering after each cutting is not absolutely necessary, the new crop springs up all the more readily from such process. The "*Merwaireah*" is a favourite grass with cattle, but unfortunately is only an annual and fails at a season when it is most wanted. I have, however, known this grass spring up in certain dhan churs in Tirhoot, spontaneously, in the cold weather, and at 2 feet high sell for Rs. 3-8 and 4 per beegah. The trefoil is perennial, and in good soil a crop will stand on the same ground for three years. If the Assamese could only be induced to lay by a small portion of the ground near their houses to the cultivation of this grass, they would in the dry districts always have their bundle of grass at their doors and ready at a moment's notice, instead of wasting hours daily of valuable time in grubbing up roots of *Dhoob* grass on which their cattle exist only for some months of the year."

4.—From Capt. H C. Johnston, Surveyor of the Derahjat, seeking for information in respect to the success or otherwise of hop cultivation in the hills, with reference to the proposed establishment of breweries in the Punjab.

The Secretary stated that he had given Capt. Johnston such information on the subject as the Society possessed, and had also referred him to Dr. Jameson's more recent report on the Botanical Gardens, N. W. Provinces.

5.—From Messrs. C. M. Villet and Son, of Cape Town, giving notice of shipment, per *Anne Whyte*, of the Society's consignment of vegetable seeds. (This has arrived and is now in course of distribution.)

6. From Messrs. D. Landreth and Son, of Philadelphia, advising despatch, per *Cromwell*, of the Society's consignment of vegetable and cotton seed.

For all the above communications and presentations, the best thanks of the Society were accorded.

*(Wednesday, 15th August, 1860.)*

Dr. Thomas Thomson, President, in the Chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected Members.

Major H. W. Wilson, Messrs. H. W. Dashwood, C. S., John Parker, C. Moyne, Capt. J. L. Nation, the Secretary Public Garden, Cawnpore, Capt. W. N. Lees, Dr. John Squire, Messrs. W. M. Whitney, J. W. Money, T. E. Wilson, Charles H. Wilson, Dr. A. J. Payne, the Rajah of Bobily, Capt. C. C. Drury, and Capt. F. Lukin.

The names of the following gentlemen were submitted as candidates for election.

Col. P. Abbott, Indian Army, Mussouree,—proposed by Col. R. Haughton, seconded by the Secretary.

B. Hooke, Esq., Civil Surgeon, Tavoy,—proposed by the Rev. C. Parish, seconded by Dr. Thomson.

The Maharajah Jung Bahadoor, G. C. B.,—proposed by Mr. C. Beadon, seconded by Col. G. Ramsay.

T. F. Peppe, Esq., Sub-deputy Opium Agent, Betteah,—proposed by Mr. R. King, seconded by Dr. John Sutherland.

C. Swaine, Esq., Indigo Planter, Contai, Tirhoot,—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Creswell.

M. E. Durup de Dombal, Esq., Monghyr,—proposed by Mr. Griffiths, seconded by Mr. Creswell.

Lieut. F. T. Pollok (Madras Army), Executive Engineer, Tonghoo,—proposed by Mr. C. A. Cantor, seconded by the Secretary.

W. Fitzpatrick, Esq., Sultangunge, Bhaugulpore,—proposed by Mr. Griffiths, seconded by Mr. W. G. Rose.

J. G. C. Herklots, Esq., Silk Manufacturer, Berhampore,—proposed by Mr. J. M. Vos, seconded by Mr. E. D. Kilburn.

G. Schilling, Esq., Talookdar, Luckunpore, Oude,—proposed by Capt. A. H. Campbell, seconded by the Secretary.

Col. S. A. Abbott, Commissioner of Lucknow,—proposed by Col. L. Barrow, C. B., seconded by Dr. Francis Douglas.

Capt. F. L. Mackeson, 2nd in command Meywar Bheel Corps,—proposed by the Secretary, seconded by Mr. C. B. Wood.

Arthur Pigou, Esq., C. S., Berhampore,—proposed by Mr. Grote, seconded by Mr. Cantor.

Capt. F. Alexander, Artillery, Meerut,—proposed by Mr. G. D. Turnbull, seconded by the Secretary.

Elphinstone Jackson, Esq., C. S., Midnapore,—proposed by Mr. Grote, seconded by Dr. Thomson.

A. J. R. Sheridan, Esq., M. D., Soory,—proposed by Mr. O. W. Malet, seconded by the Secretary.

Lieut.-Col. W. Henry Seymour, C. B., 2nd Dragoon Guards,—proposed by Mr. P. Carnegy, seconded by Mr. W. G. Rose.

J. E. S. Lillie, Esq., C. S., Hooghly,—proposed by Dr. Thomson, seconded by Mr. Cantor.

Capt. C. H. Palliser, 2nd Regt. Hodson's Horse, Gouda, Oude,—proposed by Capt. James Williamson, seconded by Dr. A. H. Hilson.

Hon'ble Sir Bartle Frere, K. C. B.,—proposed by Mr. Grote, seconded by Dr. Thomson.

Capt. Allen (late 55th N. I.), Roorkee,—proposed by Capt. A. D. Turnbull, seconded by Capt. W. E. Morton.

The following contributions were announced :—

1.—Madras Journal of Literature and Science, No. 10, Vol. V. Presented by the Madras Literary Society.

2.—Journal of the Indian Archipelago, Vol. III., Part 1. Presented by the Government of Bengal,

3.—Journal of the Asiatic Society of Bengal, No. 2 of 1860. Presented by the Society.

4.—Dr. Eatwell's Lecture on the Rise and Progress of National Medical Education in Bengal. Presented by the Director of Public Instruction.

5.—A small quantity of English Asparagus seed. Presented by J. W. Money, Esq.

6.—A few seeds of West India trees and shrubs. Presented by Lieut. M. G. Clerk.

7.—Six seedlings of *Amherstia nobilis* from Moulmein. Presented by G. Buchanan, Esq.

8.—A few seeds of a fruit tree from Cachar, called by the natives "Lolam." Presented by C. Brownlow, Esq.

9.—A few Orchids from the Andamans. Presented by Captain J. C. Haughton.

10.—A small quantity of seed and three plants of *Wrightea tinctoria.* Presented by Monsieur J. Hays, Governor of Chandernagore.

The following is a translation of Monsieur Hays's letter accompanying the above:—

"I have the honour to request you will have the goodness to present to the Agri-Horticultural Society, a small bottle of fresh seeds of an indigo tree *(Wrightea tinctoria)*, as also three of these trees.

"I have no doubt, whatever, seeing the importance of the value attached to it, that the cultivation of the common indigo of Bengal will be maintained; and that the difficulties which have occurred, in consequence of the aversion which, we are assured, the ryots have evinced towards it, will be overcome.

"Nevertheless, it may be interesting to ascertain if we can propagate in Bengal the culture of *Wrightea tinctoria* in patches of ground, or in portions unemployed or untilled which, more or less, are to be met with almost everywhere, in order to extract from its leaves an indigo which does not seem to yield to any of those which have been hitherto produced, entirely saving to the cultivator the expenses of an annual culture.

"A great number of these trees might be planted, without changing any of the established cultures, along road-ways, paths, and hedges which cross rural properties or define them; and, in a given time, the leaves could be gathered to make indigo, or the gathering could be farmed out, in the same way as the gathering of the mulberry for rearing silk-worms.

"Any persons having waste ground partially employed, or to work which they have not a sufficient number of hands, might, with but little cost, make regular plantations, quincunx fashion, in order to ascertain hereafter the elements of a simple manufacture.

"I will not enlarge on the advantages which the culture of this plant would offer, but from what I have seen, it would succeed anywhere in Bengal, and would not fail to add to the value of land.

"In requesting you to have the goodness to submit these remarks for the consideration of the Society, I beg you to express to them the regret I feel at having so small a quantity of seed to offer them."

The Secretary called the attention of the Meeting to various papers in the Journal respecting the dye afforded by *Wrightea tinctoria*, which is known in the Madras Presidency under the designation of "Pala indigo."

11.—Specimens of hemp and flax raised in Kumaon, the latter from Russian seed acclimatized at Saharunpore. Presented for report by P. Carnegy, Esq. (Referred to the Fibre Committee.)

*Nursery Garden.*

A statement was submitted from the Gardener respecting the germination of the vegetable seeds received last month from N. America and the Cape of Good Hope, showing an average percentage of 54 for the former and 58 for the latter. The Gardener reports on certain recent contributions to the garden, and refers to certain plants now available :—

"This being the best time for "planting out," I beg to bring to your notice the following plants which are now ready for removal. To prevent disappointment, early application is requested. Those who wish good fruit trees should apply at once, as the best plants are given to the first applicants

"I beg to enumerate the names of a few of the kinds which are available : vines, loquats, *Crysophyllum*, peaches, avagado pear, *Cookia punctata*, *Eugenia jambos*, guava, custard apple, mangoes, limes, pummelow, pine-apple plants, &c., &c.

"For those wishing to plant out tapioca there are a number of good plants available; also coffee seedlings raised from Ceylon seed.

"I would like to call attention to a fine lot (upwards of 2,000) of "Rhea" (*Bœhmeria nivea*) plants which are now in good order for distribution. This presents a good opportunity for those who may be desirous of trying this valuable fibre-yielding plant."

*Progress of Silk Culture at Umritsur.*

The Secretary next submitted the following letter to his address from Mr. Henry Cope, together with the correspondence therein referred to, respecting his experimental silk operations at Umritsur :—

"You are aware that I have been engaged on a considerable silk experiment at this place this year, but I have been precluded from sooner communicating the result, His Excellency the Viceroy and Governor-General having been pleased to desire that I should furnish his Lordship with reports direct on the result of my operations. His Excellency has now been so good as to permit my communicating the papers connected with this final, and, as I may fairly assert, successful experiment to the Agri-Horticultural Society of India, and I have now the honour to forward them with a request that you will be so good as to submit them to the next Meeting of the Society to be held in August."

To His Excellency the Right Hon'ble Earl Canning, G. C. B.,
*Viceroy and Governor-General of India.*

*Umritsur, 9th April, 1860.*

My Lord,—When your Excellency did me the honour to summon me to a private audience at Lahore in February last, you were pleased to express much interest in the more extensive experiment I was then about to undertake on my own account, with the view of obtaining further and final proof of my previously (and long since) expressed opinion, that the silk-worm might be reared with success in the Punjab, and especially in the Umritsur district, where mulberry trees are, as near this town, found in sufficient numbers to afford food to the insect.

Your Excellency also desired that I should communicate the results of my operations to yourself, and although these have not yet been brought to a final close, they are sufficiently advanced to enable me to state confidently to your Lordship, that ultimate success is within my reach.

I have worms of three kinds under management. The largest supply of eggs (over 2½ lbs.) was obtained from the worms I reared last year, the cocoons of which were so much admired by the members of the Agri-Horticultural Society of India, by Count Freschi then on a special mission in Calcutta, and others, and especially by Mr. Turnbull of Messrs. Watson and Co.'s extensive filature at Ghuttal.

The second, (about 10 oz.) obtained from Kashmere direct, and the third (about 4 tolahs) received from Bokhara by Lieutenant Powlett, Assistant Commissioner at Peshawur, and obligingly forwarded to me by that officer.

The first-named eggs (the acclimated) hatched on the 21st February in small numbers, and *on that day* the first mulberry leaves made their appearance. They continued to hatch at the rate of many thousands daily, up to the 20th of March, and I have now about 700 baskets full of them, in various stages of their existence. I might have been at a loss for a location, had I not obtained the obliging loan of a suitable godown in the Rambagh from the Civil Authorities, who (especially Mr. Cust, the Financial Commissioner) have taken much interest in my experiment. This will relieve me from all difficulties on this score.

The amount of food was, however, in the first instance, my chief anxiety, but I am happy to say that in this respect also, I have been completely relieved by the permission to use, for a comparatively small payment, the leaves of the trees belonging to the Local Committee.

The Bokhara worms were the next to hatch, beginning on the 24th February, and coming on most freely; while the eggs from Kashmere did not

commence to show life before the 2nd March, and came out by hundreds per day, till the 5th instant.

The first cocoon was spun on the 29th March, or in 38 days after hatching of the first eggs, and since then the number has been increasing daily amounting already to ten large basketsful. I cannot estimate the number of worms at present under feeding, but they are not less than 600,000, and should be a million according to the quantity of eggs, with due allowance for failures.

I have asked Mr. Turnbull to be so good as to lend me two experienced reelers on my paying their wages and all expenses up and down from Bengal to Umritsur and back. I am already indebted to him and Mr. Blechynden for a model reel, and hope to be therefore able to produce on the spot fair samples of silk suitable for the home market, and thus open out a new source of employment to the people, one especially suited to the Kashmere population of the town.

I propose doing myself the honour of forwarding some of the silk as soon as the reelers arrive, with a final report of my experiment; and in the meantime beg your Excellency's acceptance of a box containing 150 cocoons as a fair and honest sample of the bulk as to size, shape, and colour.

The temperature of the room in which the main body of the worms, about 450 baskets, is located is at the present moment (2 P. M.) 76· Fahrenheit. The bulk of the eggs was of course hatched under the influence of a higher temperature than that of my office, five or six weeks ago.

I shall probably not require more than half the mulberry leaves available along the public roads, and have not touched on the large supplies that are to be had in the numerous private gardens about Umritsur, and which would certainly be purchasable. I have therefore no doubt, that from four to five hundred pounds of silk might be obtained next year without planting another tree. Increased plantations will cause proportionably larger returns, and there is no reason why a large quantity of good, indeed very superior, silk should not be raised here, seeing that the temperature and climate are favourable, and Kashmere at hand to supply fresh and good stock in case of any possible deterioration in the plains. It shall not be my fault, if my health be preserved and my life prolonged, if silk be not added to flax as a staple produce of this country, great as have been the difficulties and numerous the obstacles I have had to contend with in both instances.

A Sealkote zemindar has just brought me flax five feet high.

With thanks to your Excellency for the interest you have been pleased to take in this experiment

I have, &c.,
(Signed) HENRY COPE.

---

To H. COPE, ESQ.,
*Umritsur.*

*Simla, 15th April,* 1860.

MY DEAR SIR,—I am desired by the Governor-General to acknowledge the receipt of your letter of the 9th instant. Since it was received, the box of cocoons mentioned in it has arrived, and I am directed to return his Excellency's thanks to you for them, and for the interesting information contained in your letter. The Governor-General offers you his congratulations on the successful result of your experiment so far as it has yet gone. He would be glad to know whether the cocoons which you have sent, are taken from all the three sets of worms described by you, and, if so, whether there is any difference by which one may be distinguished from the others. On your sending specimens of reeled silk, the Governor-General would be obliged by your informing him which is the produce of the Bokhara, Kashmere, and of your own worms respectively.

Yours sincerely,
(Signed) L. BOWRING.

---

To LEWIN BOWRING, ESQ., C. S.,
*Secy. to His Excellency the Viceroy and Governor-General.*

*Umritsur, 14th June,* 1860.

MY DEAR SIR,—I had hoped ere this to have been in a position to forward for submission to His Excellency the Viceroy and Governor-General, in continuance of my letter to His Excellency of the 9th April, and in reply to your letter of the 15th ultimo, a final report of my silk operations for this season, but have been prevented chiefly by continued indisposition.

In my previous communication to His Excellency, I mentioned that I had asked Mr. Turnbull, of the Ghuttal Factory, to secure the temporary services of, and to send me, two experienced winders, as I was anxious to have the silk reeled here. I regret to say that my intentions in this respect have been frustrated, Mr. Turnbull having been unable to induce any of his Bengalees to proceed to the Punjab, though I offered to pay all expenses up and down, with liberal wages while here. In the meantime, I forwarded a small number of cocoons, picked at random both from the acclimated and

Kashmere stock (the Bokhara having by the carelessness of the breeder got mixed in moving the cocoons from one house to the other, which was however of less consequence as I could not observe any difference so long as the worms remained separate,) to the Secretary of the Agri-Horticultural Society of India, for submission to the members. Mr. Turnbull was so good as to reel them at Mr. Blechynden's request, and I beg to give an extract from the proceedings of the Meeting of the Society at which this subject was brought forward.

After reading extract of my letter accompanying the cocoons, the Secretary mentioned that Mr. Turnbull had obligingly reeled these cocoons; and he submitted two small skeins of raw silk received with the following letter from that gentleman, dated Ghuttal, 7th May: "Yours of the 2nd with the banghy parcel containing cocoons sent by Mr. Cope, are safe to hand. The cocoons themselves are not quite so good as those sent last year. You may have observed how uneven and small some were. I give the preference to the Kashmere cocoons. The silk of the acclimated is, however, of the deepest colour, and these cocoons reeled the best. I think it useless to say more, as I gave my opinion on the subject on a former occasion. I send you a cocoon of each of the above taken indiscriminately with one reared here from the eggs sent by Mr. Cope. Mine is better than the acclimatized, and not so good as the Kashmere."

This silk was much admired by the members present as of *first-rate* quality, being very fine, bright colour, and good thread. It was considered that if the production be extended, it would be a favourite silk in the English market.

I have now the honour to enclose the skeins alluded to for the inspection of His Excellency. I propose sending the whole of the produce, reserving a sufficient quantity of seed for next year, to be reeled in Bengal. The total number of cocoons is in excess of my estimate. The experiment was purposely prolonged, with the view of ascertaining what increasing degree of heat the cocoons would withstand. If submitted to artificial heat, the eggs must be brought out early enough and in masses to insure the whole of the operations being successfully closed by the 15th April.

It appears finally from the result of these operations and the quality of the silk obtained, that my recent experiment may be considered to have finally and affirmatively decided the hitherto disputed question whether silk may be raised with advantage in this part of the Punjab.

If I live long enough, I hope to show that with mulberry trees grown *en-masse* for the sole purpose of feeding the silk-worm, and with suitable houses to rear them in, and the silk reeled on the spot, silk may be reared to considerable profit, because land and labour are cheap, and the mulberry tree grows here to perfection.

I beg to add that the cocoons I did myself the honour to send to His Excellency on the 9th April, were exclusively of the acclimated kind. There is no great difference in the appearance of the two.

On the bulk of my cocoons being reeled, I will ask Mr. Turnbull to be so good as to send a large skein to you for His Excellency's inspection, and shall be happy to learn that my endeavours during, with interruptions, the six past years, are considered by His Lordship to have established the fact that silk can be reared at Umritsur and its latitude. My means do not admit or I would purchase land on an extensive scale for mulberry plantations.

Believe me, &c.,

(Signed) HENRY COPE.

---

To H. COPE, ESQ.,

*Umritsur.*

*Government House, Calcutta, 23rd June,* 1860.

MY DEAR SIR,—The Governor-General desires me to say, that he has read with satisfaction the account given in your letter of the 14th instant, of your success in procuring good samples of silk. His Excellency would be glad to know what steps you have taken to make known in England the value of samples such as you enclosed in your letter, and whether the Government can be of any use in this respect.

Yours truly,

(Signed) L. BOWRING.

---

To L. BOWRING, ESQ.,

*Secretary to Governor-General.*

*Dhurmsala, 3rd July,* 1860.

MY DEAR SIR,—I have the pleasure to acknowledge receipt of your letter of the 23rd June, and am grateful to His Excellency the Viceroy and Governor-General for the continued interest His Lordship is pleased to manifest in my Umritsur silk experiment. I am thankful for His Excellency's liberal offer in regard to making the silk known in England, and

shall be most happy to avail myself of the same by making over to Government the whole out-turn of my operations to be forwarded under its auspices to England. For this purpose the cocoons shall be sent off to Calcutta as soon as I return to Umritsur, and the produce when wound, made over with your permission to you to be dealt with as His Excellency may be pleased to direct.

I remain, &c.,

(Signed) HENRY COPE.

---

*Artificial Irrigation by Windmill Power.*

The Secretary submitted the following extracts from letters lately received from Mr. R. W. Bingham, of Chynepore, in continuation of remarks laid before recent Meetings of the Society, on the subject of Artificial Irrigation:—

"Many thanks for Captain Eliot's communication; it is an interesting one, and I hope will go far to solve the difficulty. I shall communicate with my friends at home on the subject, and send them a copy of his communication. It is not necessary in all parts of this district to have a lift of 40 feet; in many places a lift of 20 feet would answer well, and in some parts less than that: for my own part, I should not require a greater lift than 30 feet; but it is always better to have extra power, so as to suit the driest seasons. I have, since I last wrote, received another communication from my friend and correspondent Mr. T. T. Pearson, of Manchester, bearing on the same subject, which shows that my remarks in your Proceedings and my communications to the "Cotton Supply Reporter" on the same subject, are beginning to attract the attention of practical engineers and machinists at home, so that I trust we shall soon have some real results. My friend writes: "'Mr. Dunlop is turning his attention to the matter on which your heart is set, *viz.*, irrigation pumps. I have just come from his workshop, and find that he is not quite prepared to exhibit it yet; but shall see it in the course of a week or two, and will give you full particulars then. He tells me it is intended to raise water about 12 feet, but not to distribute it; and is something upon the principle of the Persian wheel. The cost will be about £16 sterling. He has orders for a good many of them for Egypt.'"

"I hope Mr. Dunlop will be able to succeed in raising water by such a simple apparatus as an improvement on the Persian wheel considerably higher than twelve feet, or else it would be of little use, except in lower

Bengal; our most favourable localities require much more than that. A modification of the Persian wheel if worked by windmill power, must be *the* thing; as being simple, cheap, and easily repairable; and the reason I would prefer an horizontal windmill to any other for the purpose, is that I think the sails would not be so liable to injury in our violent eastern storms, as those of the more common construction; and could be, even if they were so, more easily protected against them. I shall write, however, to Mr. J. R. Peill, as Captain Eliot suggests, and see what his machines are like; and in the mean time keep you *au courant* of any suggestions I may receive from home or from other parts. The question will soon obtain its solution, as 'in the multiplicity of councillors there is wisdom.'

"I am glad to say the venting of irrigation projects is doing good and attracting public attention to the great necessity of Northern India; and the necessity more particularly of its hilly districts. I have no doubt but that amongst all who are now enlisted (in sympathy at least) in the cause of irrigation for our parched plains, that some feasible plan will be struck out. With this view I send you a copy of a letter from Mr. Murray of the E. I. Railway, and although I do not approve of some of his suggestions, yet it is a step in the right path, and may encourage a competition in ideas (if I may use the word), which will lead to the desired result. I need not tell you at this time of day that my views in the matter are catholic, and that although my primary idea, when I first mooted the subject, was the irrigation of my own estate, I now want to see means made known by which *all* estates in this semi-barbarous country may be watered; in fact, I want to see irrigation the rule instead of the exception, and when such is the case, there is a grand future looming for India. With irrigation at command and with European energy and skill to back it, India will become the garden of the world, and the day is nearer than many people suppose.

"Yet I do think that however Mr. Murray may be right in the abstract as to the value of an engine, that he is wrong in this instance. To employ a skilled mechanic to take charge of an engine, and to feed it with five maun of coal per hour, would *not* pay in the provinces. Mr. Murray is right so it will eventually be the cheapest method, but it is not so now. An engine would rapidly become a nuisance, and would be left under its shed as numbers of engines are at present in Tirhoot, as a proof of their proprietors' folly in setting them up. At least one lakh of rupees worth of engine-work now stands a laughing stock in that zillah. Suppose a shaft broken, where is it to be repaired? Mr. Murray is a railway engineer, and on the railway

are workshops and workmen employed on a large scale, and spare shafts and spare parts of all engines in abundance. These engines can be used; but not with us, who have not those means to repair damage, and whose nearest harbour of refuge in such a case, would be Calcutta. No, although I admire engines, yet as Captain Eliot says, they are not the article for the Mofussil. Mr. Murray says, windmill power will not answer, as you cannot have the wind blow when you want it. Now, I never dreamed of that as an objection: I only dreamed of too much wind, and for that reason recommended horizontal windmills for the purpose. The 'wind bloweth where it listeth,' but in Behar and Northern India, the prevailing breeze is from the West; eight days out of ten during the hot weather we have a strong westerly breeze, hot as the breath of a furnace, glorious for tatties, and therefore capital for a windmill; we have not the rapid shifts of wind which are known in England, excepting in the rains, and could therefore depend pretty regularly during the chief irrigation season on the wind to drive our sails. What we do want is, at present, *wind or any other power, without any complicated machinery, and such machinery as is employed to be such as the common village carpenters or blacksmiths could repair or replace.*

"Eventually, no doubt, but we shall have steam: and the sooner the better, but the country is not prepared for it yet. The hill reservoirs noted by Mr. Murray, I have already advocated: and they will eventually be *the* thing, as this district possesses such wonderful facilities for their construction, even more than Mr. Murray supposes, as the rivers yield a supply of considerable value even in the hottest months. A private company to construct them is at present hopeless, the Government must eventually do it, and they will do it, but we cannot wait till *then.* We must have some expedients in the mean time to raise our water for us, and probably before the Government canals are ready we shall have engines, but that and the canals are both in the future. Mr. Murray's third proposal is 'artesian wells, if practicable.' Yes, they are practicable physically, but not morally, *i. e.* that we have no trained artizan to sink artesian wells, and the cost of an experimental construction can only be borne by a Government or a large company like the E. I. Railway Company. Proprietors of land and farmers must deal with known facts, and work upon known data. Few could afford to be let in for the amount required to sink a second *Grenelle,* and until borings have been taken, who shall say that would not be the figure, multiplied tenfold by having to import your skilled labour, tools, &c., &c., from Europe. No! artesian wells must also go into the future; they are not for the present in Central India.

"In default of windmill power, we shall have to try bullock power, with either pumps or Persian wheel apparatus; but bullock power is unsatisfactory."

*Copy of Mr. A. G. Murray's letter to Mr. Bingham, dated Agra, July 16th.*

"I have just read your letter to the Horticultural Society about windmill for raising water for irrigation.

"Windmills would never do; people at home have no idea of the quantity of water needed to irrigate land here. You would need some 50 windmills to do any good, and would also have to make a reservoir to store the water, as the wind won't always blow when wanted.

"A windmill might do for a garden or any small amateur job, but nothing more.

"There are three other ways to get water, *viz.* to make reservoirs in the hills, to the South of Sasseram; to make artesian wells (if practicable), and lastly a steam pump: this is what you will have to come to after all in defect of hill reservoirs; all sorts of ways of raising water have been tried, but none equals an engine.

"A great deal depends on the area you want to irrigate, and also on what sort of land-tenure you have: if you want to irrigate a large area, say 1,000 acres, and have a good tenure, you had far better get a good pit pumping engine at once: those made to work direct, as made by Neilson and Boy, Glasgow, are very good and cheap, and no expensive building is required. Don't have anything to do with those small fancy agricultural engines, they are not fit for the work and not nearly large enough. You should have a 50 horse-power engine at once, which would give you a respectable stream of water, and always ready. It would need five maunds of coal per hour, or 10 maunds dry wood to work it.

"Recollect, if you adopt machinery you must keep a mechanic to look after it, and he can take care of a 100 H. P. engine just as easy as of a 5 H. P. engine.

"It is quite impossible to compare the expense of hill reservoirs and steam engines. In your district I suppose the rivers are all dry in the hot weather, and the water must be gathered during the rains and kept till wanted. Now to store enough water to irrigate Shahabad and Behar, would be a serious undertaking, and could only be done on a large scale, and to get at the comparative feasibility of engines or reservoirs, you would need to make surveys, guage rivers, get up a company, get an Act, buy land, and whole series of operations, that would take ten years to accomplish, which would be very

fine when it was done. Now a really good pumping engine that would do your work, would cost, say from rupees 5 to 10 per acre irrigated; of course, you need not irrigate the whole at once; in fact I believe the interest on capital and working expenses would be some rupees 1-8 to rupees 2 per acre per annum, which is much the same that Government charge for canal water, you would be independent of them and keep all moonshees off your property, which is well worth four annas per acre more.

"You give no details about the nature of the country, depth of wells, cost of coal, quantity of water needed per acre, cost of water channels and such like, so it is impossible to be exact.

"Don't try any gimcealks; don't deceive yourself with the notion of getting water at less rupees than 1-8 per acre per annum; it can't be done; if it won't pay now, prices are rising so fast that it soon will."

*Communications on various subjects.*

The following letters were also submitted:—

1.—From Capt. G. F. Vincent, Stanley, Hong-King, dated 21st May, intimating that he is endeavouring to establish a Soldiers' Garden, and asks for assistance from the Society. Capt. Vincent remarks:—

"The Chinese are the most industrious people and most accomplished gardeners I have ever had the good fortune to meet, nor is there any thing derogatory in "taking a wrinkle" from them, seeing that they had attained their present high state of civilization when our ancestors painted their bodies and ran about stark naked, so there is some ground for the appellation of *Barbarian*, as applied to us by the Chinese.

"However, letting all that pass, I must say the manner in which they cultivate vegetables (flowers do not come within the limits of their philosophy) is perfectly beautiful, and would even charm the most fastidious London or Hampton gardener. I am in great hopes that, if you and your Committee are only liberal in your supplies of seed, I may induce the Chinese peasantry of this neighbourhood to enter largely on the cultivation of English vegetables, for which they would find a ready sale, instead of confining themselves to melons and other native produce. I see no reason, for instance, why potatoes should not be grown on these hills, as well as at Cherra Poonjee (which they very much resemble in their formation) instead of being imported, as at present, from California. Nor am I aware that propinquity to the sea is any drawback, since I believe potatoes are grown on the Western Coast of England. However, I am determined to make the experiment, if only aided by you.

"One thing I may mention that strikes me just now, and which ought to be made known to *every* tea-planter in India, whether connected with our Society or not, *viz.* that the tea seed ought not to be sown lower than *two* inches below the surface of the soil.

"Common sense ought to have pointed this out long since, for heads of young plants are invariably found under large (so-called) indigenous trees, on the ground being cleared of jungle, which, having merely fallen on the *surface* of the earth, have struck root and thriven, thus proving the theory which is further confirmed by the very nature of the root."

2.—From G. E. Evans, Esq., Analytical Chemist, Museum of Economic Geology, reporting on the soil from Bourbon recently received from Capt. W. H. Lowther, and submitted at the last Meeting :—

"I have much pleasure in sending you the result of my analysis of the soil from Bourbon, forwarded by you.

One hundred parts contained

| | |
|---|---|
| Water ... ... ... ... | 13·20 |
| Organic matter... ... ... ... | 9·00 |
| Insoluble siliceous matters... ... ... | 35·40 |
| Peroxide of Iron and Alumina ... ... | 40 71 |
| Carbonate of Lime . ... ... | 0·04 |
| Ditto of Magnesia ... ... ... | trace |
| Alkaline Chlorides and Sulphates ... ... | 1·12 |
| Loss ... ... ... ... | 0·23 |
| | 100·00 |

"It is a loose, friable, very ferruginous soil; its power of retaining moisture is of the medium quality, and would be vastly improved by the addition of lime.

"The analysis of soils is every day becoming of greater importance, and to render such more useful to the cultivator, an amount of collateral information might be added by those who collect them, which cannot possibly be given by the chemist not on the spot, such as the district, its elevation, inclination, and exposure, the geological formation upon which it rests, its depth, and the nature of the subsoil, qualities and produce of the crops grown upon it, and any other useful information as regards drainage, distance from market, rent, price of labour, facilities of land or water carriage, and for obtaining supplies of manures of various kinds."

3.—From Henry Cope, Esq., dated 27th July, reporting the progress of the Public Nursery Garden recently established at Umritsur :—

"As the local Committee are under obligations to you for assistance in regard to seeds obligingly supplied by your Society, it may be interesting to you to know something about the progress of the garden or rather nursery which the Committee are under my care bringing into active existence. The quantity of ground now under cultivation, is about two acres of Seris, Sissoo, Tallow trees, Bauhinia, Butea, Acacia, and one or two other common trees. We have not less than 70,000 seedlings in the aggregate and the numbers increasing every day. About 25,000 seeds of jamon and mango alone have been sown. Then we have smaller quantities of the Dhoon Seris (a most beautiful tree) Toon, Casuarina, Terminalia, Tamarind, Date (Persian Gulf) Soap nut, Lime, Loquat (more than 1,000), Teak, Cæsalpinias, &c., altogether I fully expect that before the garden is twelve months old there will be more than 100,000 seedlings fit for distribution. There are patches of Sunn *(Crotalaria)*, Sunnokra *(Hisbiscus)*, Cotton, Imphee, &c , on trial. Of the latter I have to mention that the whole of the imported seed sent by the Society on two occasions, has been a failure, while the last packet of acclimated is coming up beautifully, and will I trust prove a success; it occupies four large beds. I shall be happy to report further progress at the end of the rainy season."

4. From R. A. Sterndale, Esq., Seonee, dated 3rd August, offering a few more remarks respecting teak tar in continuation of those submitted at the June Meeting :—

"There has been some delay in answering your letter of the 20th of June, owing to my being out in the district, and my inability therefore to get any practical knowledge of the information you require. Teak tar is not made and sold in very large quantities by the natives here, for, as I mentioned in my former letter, it is used by them only medicinally, I am therefore unable to give you the district rate of sale, but from recent experiments the cost, &c., is as follows: In the first place the wood, that which has been cut about three months is the best, if too fresh the tar is thinner; about 20 seers of the above wood will yield one seer of tar, to extract which from one to two maunds of cowdung fuel (which is always used) is required, this costs about two annas a maund, allowing the full quantity of fuel which would be four annas, say one anna for the wood (which is over the price), and two annas daily hire to a man to attend the distilling; the maximum cost of one seer of tar is seven annas. If a larger quantity is made, of course it would be cheaper, as one man could attend to several distilleries. I should say four annas per seer is a fair average.

"From three to six seers according to locality can be obtained here. Yesterday I measured off a cubic foot of good teak and had it distilled, the product was about one seer of tar, the fuel one and half maund of dried cowdung.

5.—From R. W. Bingham, Esq., Chynepore, dated 10th July, reporting on the working of the American plough from the model in the Society's Museum:—

"I like the little plough amazingly: it is a decided success, and for next season I purpose (D. V.) to have a number of them. One ploughing with it is superior to four with the native plough; and I think the better class of native agriculturists about here will have a few for next year; they admire it amazingly. I used it first in a field thickly covered with *rarree* and *koos koos* grass which is of rapid growth, and almost incapable of eradication. The native plough leaves it as it stands, and planters use hoes for the purpose of keeping it down. This little plough, however, cuts it away about nine inches under the surface, and, if the ground is tolerably moist, often drags away large quantities of roots with it. The field I ploughed consisted of about two acres, it was ploughed twice over, and although 20 days have elapsed since the last ploughing, scarcely a vestige of grass is visible of any kind. Another two acres I ploughed with the same plough, and sowed with indigo, while the patch along side of it was ploughed and hoed in the ordinary fashion. The difference is most marked in favour of the American plough, the leaf of the indigo is larger, the crop more advanced, and no appearence of weeds as yet, while the other patch is green with them. A pair of buffalo bulls work it with great ease, and can easily plough one and half beegahs (pucka) per diem; but at present I am obliged to have one man to drive the cattle and another to hold the stilts. I have got land prepared also for the Imphee, and Sea Island cotton seed, and after sowing those, shall prepare land for oats, wheat, and gram with it, and keep you acquainted with the results. I am most sanguine so far, and as I have no doubt but that the ploughs can be turned out *in quantities* at rupees 20 each, I think they will be of gradual adoption. The scarifier I have not yet found of much use, but doubt not it will hereafter be useful in clearing the rows between the cotton plants of grass and weeds."

In a subsequent letter of the 1st August, Mr. Bingham continues the subject.—

"The little plough still continues to give satisfaction; I am better pleased with it the longer I use it, I sowed two beegahs of indigo with it as an experiment. The present appearance of the plants is better: more

advanced, the leaf larger and altogether better looking than plants sown with the usual native plough in the same field, while the latter is full of *motha* grass and weed, and in the former *motha* is rare and weeds are *nil*. I have tried another two beegahs for cotton planting; good strong loam but completely overrun with *koos* grass, a Shahabad planter's torment and only second to the *rarree*, but the share tears through the matted roots of the *koos*, and I am convinced from the appearance of the land, that two years cultivation with this plough would demolish the *koos* entirely. Other land has been sown with Imphee, but that has not yet germinated. It has now been six days sown; I almost fear it is a failure. But the beauty of the plough is in cultivating *old waste* land. Six ploughings with the native plough are nothing like one with this, and being of a manageable size the native ploughmen have taken kindly to it: but I have already worn out one plough-share and have had to make another: which my blacksmith has succeeded in doing. I have ploughed at least 40 acres with it, and shall now cultivate with it for oats, carrots, and grasses. I believe the natives will adopt it, at least those who can afford the first cost; they wanted to borrow it from me which shows they appreciate it. Example is much better than precept. I have hardly found a use for the scarifier yet: but it will come into use for weeding the cotton rows. I have Pernambuco cotton now *nine feet high*; it has been sown twelve months."

6.—From J. W. B. Money, Esq., copy of instructions given to him for raising Asparagus and Artichokes.

7.—From George Jephson, Esq., Simla, dated 6th July, conveying his best acknowledgment for the donation of rupees 500 awarded to him at the June Meeting, for the valuable information communicated by him, and the trouble and expense incurred in connection with the Society's reference on the subject of box wood, for engraving purposes.

8.—From Captain Edward Thompson, Deputy Commissioner, Seetapore, advising the formation of a Government garden at Seetapore, and applying for seeds of all kinds. *Resolved*, that assistance be rendered to the best of the Society's ability.

9.—From Henry Cope, Esq., Umritsur, dated 19th July, intimating that the culture of the mulberry and rearing of silk worms is carried on in several parts of the Punjab by natives, and forwards a few cocoons, as a sample, from one of the rearers, Kurreem Khan, of Tiloknath.

"Having sometime since learnt that there was another party in this country, who had for some time past successfully cultivated silk worms, and regarding whom singularly enough, nobody appears to have

heard before, I determined to see him on my way to Dhurumsala, where I recently spent fourteen days, learning much and seeing much of which I had no previous idea. The man is a Mussulman named Kurreem Khan, resident of Tiloknath, in the low hills of the Kangra district, between Roorpoor and Dhurumsala. He was kindly sent for to the latter place by Mr. R. Saunders, the Deputy Commissioner, at my request, and I subsequently saw him in his own place. He informs me that he has for many years reared a small quantity of silk, but that this year he has increased his cultivation and obtained some 16 seers of silk, besides a considerable quantity of eggs. with the view of next year still further extending his filatures if he meets with encouragement; I promised him that should not be wanting as far as I was concerned, and have asked Mr. Saunders (of whose anxiety and ability to extend every thing useful and profitable on behalf of his people, I venture to bear the strongest testimony) to do what he can for him in the way of securing mulberry leaves, which abound at Tiloknath, Kolleh, &c.

"At Peshawur, too, something has been done, and that something in the right direction and with the auspices of Lieutenant Powlett, Assistant Commissioner, who found a man who had reared silkworms in Peshawur till the Sheikhs destroyed the mulberry trees. He obtained 11 seers of cocoons from Bokhara eggs, which were converted partly into silk (¾ of a lb.) and partly into eggs for next year, and I have every reason to believe that if Lieutenant Powlett should remain at Peshawur he will continue and enlarge the experiment.

"Thus at four distinct points has silk been obtained this year in the Punjab, at Peshawur; at Dharrea, by Pergunnah Shuhurgurh, Zillah Goordaspoor; at Tiloknath on the highland of Kangra, and at Umritsur. Mr. Knox, Assistant Commissioner in Kooloo, would also have made an experiment but he was too late in his application to me for eggs. I have given a small quantity of acclimated eggs from my store at Dhurumsala, to Mr. E. Meclein, of the Kangra Tea Company, and also to Mr. Rogers, Superintendent of the Government Tea Plantations at Holta, where considerable plantations of *Morus Chinensis* and *Morus multicaulis* already exist. I fear however they will not succeed this year, but am ready to assist them with more eggs next year should they wish, in the full belief that every thing is favourable for silk cultivation in the Kangra valley.

"I have done something towards introducing the *Morus Chinensis* into Dhurumsala itself."

For all the above communications and presentations, the best thanks of the Society were accorded.

*2nd. One-fifth* of the ascertained profits of the *five preceding years* is divided *annually* between the Policy-holders and Shareholders—three-fourths to the former, and one-fourth to the latter. The remaining four-fifths are set apart to enter into the average of the succeeding years, and *thus to provide against unforeseen contingencies.*

It is most satisfactory to the Directors to state, that, *notwithstanding the unusual losses occasioned by the Mutinies in India,* the amount of profits declared on the last annual division, *viz.* in May, 1859, was *equivalent to a reduction of thirty-six per cent. on the original annual premium.*

*3rd.* The Tables of Premium have been framed with the greatest care, and those applicable to Indian lives have been deduced from actual, and reliable experience, obtained from the records of the India House.

*4th.* Proposals are received for Assurances for the whole term of life, either on the participating, or on a non-participating scale at a lower rate of premium. Also for short periods varying from one to seven years on the most moderate terms.

*5th* Rates of annual Premium for an Assurance of Rupees One Thousand :—

## CIVIL.

| Age. | 1 year. | 3 years. | 5 years. | 7 years. | Life with profits. | Life without profits | English rates. |
|---|---|---|---|---|---|---|---|
| 20 | 22 | 22 | 23 | 24 | 42 | 32 | £1 13 0 |
| 30 | 27 | 28 | 28 | 29 | 48 | 39 | 2 8 0 |
| 40 | 32 | 32 | 23 | 33 | 59 | 49 | 3 3 0 |
| 50 | 38 | 40 | 40 | 43 | 74 | 62 | 4 5 8 |

## MILITARY.

| Age. | 1 year. | 3 years. | 5 years. | 7 years. | Life with profits. | Life without profits. |
|---|---|---|---|---|---|---|
| 20 | 26 | 27 | 28 | 28 | 47 | 35 |
| 30 | 32 | 32 | 33 | 34 | 54 | 46 |
| 40 | 39 | 40 | 40 | 40 | 63 | 46 |
| 50 | 45 | 46 | 48 | 47 | 77 | 53 |

*6th* On return of an Insurer to Europe, either for ***a temporary or permanent residence,*** and ***without reference to the state of health on return,*** subject however to notice being given at the London Office the Premium is reduced to the English rate, corresponding with the ***age when the Assurance was originally effected;*** and in the case of participating Policies, the profits are allowed on the ***English rate of Premium,*** whereby Indian Assurers can continue their Policies in England on *most favorable terms.*

*7th* Military Officers holding Civil appointments are allowed to subscribe at the Civil rate of premium, on notice being given to the Agents of the Society.

*8th.* Premiums are payable either annually, half-yearly, quarterly, and, on certain conditions *monthly* and a grace of 28 days is allowed for such payment.

*9th.* Policies for the whole term of life, which have been in force for five years, will be purchased by the Society, or loans granted thereon to the extent of two-thirds of their estimated value.

*10th* Medical referees are remunerated by the Society by a fee of *Sixteen Rupees* on proposals for assurances *not under Co.'s Rs.* 2,500 :—but for any less sum the fee to be settled by the applicant.

Tables of Rates, Forms and Instructions for effecting Assurances, can be obtained on application to the Secretaries, or the Agents at Allahabad, Agra Meerut, &c.

BRADDON AND CO.

CALCUTTA, *September* 1860. *Agents and Secretaries.*

*The Office of the Universal Life Assurance Society is* No. 14, *Strand.*

THE JOURNAL

OF THE

Agricultural & Horticultural Society

OF

INDIA.

---

## *Remarks on the various kinds of Indigenous Cotton of Eastern Bengal, with a few observations on the culture of Foreign Cotton: By* T. Allan Wise, Esq.

*(Communicated by the Bengal Chamber of Commerce)*

*To* F. A. Glover, Esq.,
*Civil and Sessions Judge of Mymensingh.*

Sir,—In accordance with your request that I should send you specimens of indigenous cotton and any remarks I might be able to furnish you with on the subject of cotton in Eastern Bengal, I have now the honor to forward to your address these few notes and the accompanying samples of cotton sold in the bazars of these districts.

The shortness of time you have given me in which my remarks must be furnished, necessarily divests them of that fulness of information and exactness in detail I should have liked them to possess, but still I hope they may be of some use such as they are.

In former times as you are aware these districts, and more particularly Dacca, were famous for their cotton and cotton fabrics, but for years past they have been surpassed by America, and now but little cotton is grown in Bengal comparatively; each year sees less produce, and in many parts, where formerly large tracts of land were sown, the plant is hardly known. The spinning mills and steam looms of England now a days enable the English merchants to supply thread and cloth to the people at such a low rate, that the same quantity of cotton for the villagers is not required, and consequently less cotton is sown; and besides the value of all other crops has risen so much that the cultivators find cotton a less profitable crop than rice, safflower &c. From the inquiries I have made, the only reason I can get for the ryots not cultivating more cotton is, that it is a very laborious crop to raise. It also is liable to be injured by long droughts, by hail storms, insects &c. while the profit from it is so small that it is not considered worth the risk run by cultivating it. Formerly Dacca itself and the surrounding country was noted for its cotton, but more especially for its cotton cloths which were well known in Rome in Cæsar's time, and in fact were the wonder and admiration of all the civilized world. At Sat Mozit to the West of Dacca, Copassia to the North, Sonergong, Behrampore &c. large quantities of cotton were produced, and even of late years small quantities that have been sent from these places have retained for them the character of having cotton of very fine staple. Little however is grown now in the plains of these districts for by far the greatest quantity brought to the bazaars has been grown in the hills of Cachar, Garrow range, and the mountains of Assam. Every village almost, however, can shew a field or two of it, but in comparison to former times the quantity is small, and rice, mustard &c. have taken its place as being more certain, more easily produced and more profitable. These districts then having been once

so famous for their cotton may be considered as cotton growing ones and might be so still: (for soil and climate &c. have not changed so much of late years): at some future day, perhaps not a very distant one, they may regain their former character. Many people say that India can never compete with America in cotton growing, and I admit under the present system of cultivation it cannot, but with that improved, and superior kinds of seeds sown, I do not fear for the result.

In speaking of indian cotton people generally regard it all as one species, viz. the common indigenous cotton of Bengal which is grown more or less in all parts of these districts; but this is a mistake, for I can mention nine varieties of it, differing from each other either in length and fineness of staple, size of plant, or in fitness for different soils and localities. Each of these was perhaps not quite distinct from all the others originally, but from the difference in soil and situation in which they have for ages been cultivated, I believe they have got as it were acclimatized to them, and, having changed slightly from what they were, become new varieties.

As far as my information goes the following are the different kinds of cotton grown in Eastern Bengal, and as well as I can can make out are as unlike each other as the cottons of America.

1st. The Tipperah Hill cotton.
2nd. The Sheraj cotton.
3rd. Bogga cotton, .. .. .. .. { Borro Bogga. Chotto Bogga.
4th. Borailli cotton.
5th. Dacca cotton.
6th. Dacca Tangari cotton.
7th. The common Bengal cotton.
8th. Foreign cottons lately introduced.
9th. Seemul or wild tree cotton.

From this list it will be seen that there is no want of different kinds of cotton in Bengal and perhaps by proper cultivation and management some of them may prove at a future day of very great value. I shall now say a few words about each, reserving my remarks on the culture of cotton and cotton cloths till I come to the common Bengal cotton.

1st. Tipperah cotton is a species peculiar to that district, but never having seen it, and little or none of it being brought to the Mymensingh bazaars, I can say nothing about it.

2nd. Sheraj cotton. This also is entirely a hill species and I can get no information about how it is grown further than that it is brought from Assam and probably the western hills of the Garrow range. It is considered the second finest, (Borailli afterwards noticed being the best species), that is brought to the bazaars of Mymensingh district, and from it the cloth worn by the better class of natives is made. It is brought by the ryots in the bazaars for their wives and daughters to spin into thread which they sell to the professional weavers to make into cloth for the markets.

3rd. Bogga cotton is the coarsest kind got in these bazaars, and as it does not grow on the plains the people can give no further information than that it comes from the hills of Assam and Rungpore. From it is made the "do-sutti" or "two thread" cloth, a very coarse fabric of which the sails of boats are made.

This is probably the cotton grown in the long range of Garrow, Cossya and Cachar hills which supply to so large an extent these markets. In Cachar the way in which one great class of its inhabitants viz. the kookies cultivate is peculiar. These kookies are a wandering race of people who set up their villages on any convenient hill side, and as soon as the land gets a little exhausted they remove every thing, houses included, to another spot. They cut down the forest

and underwood and as soon as it is withered a little they set fire to it and so with little labour clear all the land they want. On this virgin soil they break the hard surface of the ground with little axes, and broad cast sow mustard, safflower, cotton &c. without much trouble. The cotton thus produced cannot be looked on as of fine quality fit to compete with that which has had attention paid to its culture, and the consequence is the color is bad and the staple short. It is bartered by the growers in the bazaars near the hills for what they want in exchange and thus the dealers supply the markets on the plains.

Perhaps this may be as good a place as any in which to introduce some calculations made a few years ago by an Officer in Cachar. He had a seer of gotolahs of cotton weighed and cleaned in his presence and the result was seed 51 tolahs cotton 37 tolahs and refuse 2 tolahs. He thus writes,—"one maund of kapas (90 tolahs to the seer) is equal to 90lbs. the prime cost of which would be above 3 Rs. 4 as. the cleaning 12 as. the result would be 37lbs. of cleaned cotton 4 Rs. The expenses attending the conveyance of which to Calcutta together with the charge at the transit ghat would be about 5 annas and 4 pie, from which I calculate that 90lbs. of cotton freed from seed might be delivered in Calcutta, all expenses paid for, Rs. 4-5-4 pie which in English money would be equal to 8–8 shillings or about 2¾ per lb."

Of the Bogga cotton brought from the hills there are two kinds, the "Chotta Bogga" and the 'Borro Bogga,' differing completely in size of seed and staple, the former being called "Chotta" or small from being much the smaller of the two in every way.

4th. Borailli is the finest kind of cotton procurable in these marts and from it is made the very fine thin cloths which the landed proprietors and wealthy natives are fond of wearing. It is the largest cotton plant

I know, reaching the height of some 8 or 9 feet with beautiful dropping branches, which if erect would measure more, and as it is a perennial must be very profitable, but it only grows in high village land quite clear of the inundation. It bears pods every month in the year for three or 4 years in succession and being in every way such a different plant, from any of the Dacca kinds, I am inclined to think it is peculiar to Mymensing district, or more probably is a foreign kind imported here by some of the early Portuguese settlers who had large villages in the district.

5th. Dacca cotton. Before entering upon the subject of the Dacca district which gained for Bengal its notoriety as a cotton country I may say a few words about the kind of country it is. The greater part of it consists of the alluvial deposit of which Bengal is chiefly composed and the soil is of a lighter kind than most of the surrounding districts. The Booriganga traverses it from west to east, while from north to south flows the Lukhia river. Besides these large rivers there are many nullahs or small streams flowing into them and being open most of the year they enable the husbandmen to bring at little cost their products to the different bazaars, some of which are very large ones. To the north of Dacca however a different kind of soil exists consisting of a reddish clay which is little cultivated, so that vast tracts of land in the district are now covered with dense jungle. Whether this land will be soon brought into cultivation again or not is a difficult question, but certain it is that at one time all these dense jungles were the scenes of industry and life. To the North of Dacca, where the extensive bleechfields existed in the days of her prosperity, there is now a vast jungle inhabited only by wild animals. To the north east of Dacca is Copassia, so named from the fine quality of cotton it produced, but now none is to be seen there and the places where most likely it

was grown, are now producing only useless jungle. But independent of these wastes Dacca has ample land for cotton of all soils, and should cotton growing now be revived in it the want of fine land will not be the drawback. Then the neighbouring districts of Tipperah, Furreedpore and Mymensingh have each enough high fine land to supply any quantity of the article, lands that are so rich they have produced crops year after year for ages without manure, and which are quite clear of the highest inundation.

But to return to Dacca cotton. This cotton as the name indicates is peculiar to the district and grows in a very different way from any other species I know of. It loves the rich, moist, alluvial or chur soil towards the east of the district, and more especially spots which are inundated during part of the year. It is sown in ridges, and to make the most of his land the natives plant chillies, garlic &c., between them. It is sown in September and October, and being an annual the crop is gathered within the year. On the subject of the real cotton of the district from which its famous cloths are made, Dr. Taylor the former Civil Surgeon of the station, has given, in his account of the district, the following remarks. He says "the material of which the fine Dacca Muslins are made is entirely the produce of the Dacca District. The plant is an annual one and attains a height of about 5 feet. It is described by Roxburgh as a variety of the *Gossypium herbaceum* and is said to differ from the common cotton plant of Bengal in the following particulars: 1st. The branches are finer and more erect and the lobes of the leaves more pointed. 2nd. The whole of the plant is tinged of a reddish color. 3rd. The branches which support the flowers are larger and the exterior margins of the petals are tinged with red. 4th. The staple of the cotton is longer, much finer and softer. This is the "Dasee" or indigenous cotton of the district, which has been cultivated from time immemorial."

Dr. Taylor says, two crops are raised in the district, they are gathered in April and September, but the first yields the finest produce and is the one that is chiefly cultivated; such is the cotton from which the fine muslin of Dacca is made, and as it is produced at little cost for cultivation and the staple is so fine that it might be cultivated perhaps as advantageously almost as foreign species, Mr. Finnie, a servant of the Company's plantations in the Doab, wrote in 1841 to the Secretary Agri-Horticultural Society of India the following: "No. 2 (specimen) is the produce of Hindoostanee seed cultivated by me upon the American mode and separated from the seed by the gin. I leave it to you to determine what effect cultivation has had upon the staple. But it may be necessary to mention that the little field from which this was gathered (although planted late) has produced double the quantity that the same seed upon similar soil, produced under native management did, and is still growing and is full of young bolls forms and flowers, while theirs have long ceased to bear and is now leafless." So much for cultivation: as a further example of the effect of attention and care on the growth of cotton I may mention that Mr. W. Balston in his examination before the Colonization Committee of the House of Commons when asked, upon what ground do you say that irrigation is a necessary expedient for the successful growing of cotton? Replied, because irrigation increases the produce from 60 or 70 ℔s. to 400 ℔s. an acre.

With these wonderful effects of cultivation and irrigation before us and knowing that the Dacca cotton has formed the finest cloths ever made, we may imagine that its cultivation in this district would be a very profitable one if properly managed, and I have no fear that this district would take a high place in the cotton market were the staple a little improved to suit our machinery and the

quantity produced per biggah increased so as to attract the villagers to its growth.

6th. Dacca Tangori cotton or cotton grown on high land is another species that seems to be peculiar to this district. It grows on the high red clay lands to the north of Dacca and attains the height of 5 feet. It is sown in July and the crop is reaped in February. It bears a light crop for three or four years and is probably the same kind that formed the attraction to Cospassia and the rest of these jungles which once teemed with a wealthy people who had brick houses, tanks &c., all now in ruins, but it seems to have been gradually relinquished. Thus only a few years ago at Sodapore a village to the N. W. of Dacca large fields of this cotton were sown but now not a single patch is to be found there. The ryots say it is too troublesome to cultivate, but I doubt rather they do not manage it properly, do not allow the land to lie fallow every 4th year as was formerly done, and the crop is abandoned.

7th. Common Bengal Cotton. I now come to the common or indigenous cotton of Eastern Bengal, a cotton which is looked on as one of the worst that reaches the London market, being of too short a staple. With this inferior cotton however the entire clothing of the inhabitants of these districts was till lately made, and even at the present day it is used to a considerable extent. Cotton is little grown now a days in Bengal and I fear much it is on the decline, and that year after year it will be less cultivated unless some fresh stimulant recalls it into favour again. The Dacca cotton, as I have mentioned, grows on low lands, but this refers only to the five kinds peculiar to the neighbourhood of the station, while the indigenous cotton of Dacca Mymensingh &c., is a very different plant. It is sown in November, the flowers come out in May or June, and during the rains the bolls of cotton are fit for gathering. It is an annual and consequently having to be cultivated

every year is an expensive crop, besides which the same field does not produce it two years in succession. The lands it is chiefly sown in, and I have seen it in all the Eastern districts, are high, clear of inundation or nearly so, the soil neither of a very rich moist kind, nor a very light one but a middling soil, approaching what in native phraseology is called "Doassoli." It grows to the height of three feet in some places, but I have seen this year several fields of it in which the plants were not two feet high, and yet they were covered with flowers and promised a good crop of cotton. Manure or irrigation the natives do not give their plants and the consequence is that often a long drought, as sometimes exists in May and April, greatly reduces the returns from the fields, hail-storms and insects too damage the crop, but worst of all the cotton costs the Ryot too much trouble to cultivate, and this, all say, is the real reason it is not cultivated now a days so much. Requiring to be sown each year is another drawback, and as he can get for a little more trouble two crops from his land in one year, he prefers having rice and mustard, which now that the value of all the products of India has so increased, remunerate him very much better. A cotton bringing a good price in the market, and requiring to be sown only once in three or four years, would no doubt induce the ryot to cultivate it, for he would of course take to the most profitable crop he could get. Another potent reason for the Ryot not cultivating cotton is that it is not required by the villagers themselves so much as formerly. In former times almost every Ryot had his patch of cotton for home consumption which his wife and children spun into thread. This thread was made over to the professional weaver who made it into cloths of eight or ten yards in length by one in width, while as his remuneration for his trouble he retained part of the thread. Thus the cloth in the native sense cost nothing. Regarding cloths the native of Eastern

Bengal has curious ideas, for he considers that made entirely in his village, the thread by the members of his family and the weaving by his neighbour, as the most durable, and registers it in his mind as equal to eight months wear, and if he can get it made, prefers it to all others. That made by the village weaver of English thread comes next in his estimation, being valued at four months wear, while last of all he values the English made cloth which he says lasts only three months, and yet this English cloth is supplanting the village made; it is so much cheaper, but still good quantities of home made cloth are worn. In many villages in the mornings and afternoons, may be seen the mother sitting in the shade of her house, surrounded by her children, cleaning the bolls of their seeds or turning the prepared cotton into thread, not for sale, but to hand over to the native "Jolla" or weaver to convert into cloths for herself and family. Cotton then is an excellent product for the villagers of these districts it would appear, but this is not sufficient to promote the growth of it, English cloth and English thread being sent out at such low rates that the weavers find themselves unable to compete with the steam looms of Lancashire. Thus the weaver instead of applying to the women who gain their livelihood by spinning goes to the bazaar and buys English spun thread at a much cheaper rate. It is this that has ruined the cotton and cloth trade of these districts, and even the city of Dacca which supplied cloth to the inmates of the palaces of the East, and to even the Court of Rome in her brightest days, is now declining, less cloth is produced in it than formerly, the bleechfields it owned in its prosperous days are now covered with dense jungles, while the more skilful spinners and weavers whose transparent fabrics were the wonder and admiration of the world are each year losing their cunning. Even the moderately fine cloths of these districts are made of English thread, but the very thinnest,

made for the rich, is still made there as also in the ancient towns of Bickrampore, Sonargong &c. For these delicate fabrics European made thread will not do, and recourse is still had to the fine indigenous cotton and the light fingered workers of the district. So fine is the thread that no machinery could make it, and so delicate is the web the weavers declare they can only work their looms during the cool of the morning while the dew is still on the ground.

8th. Foreign Cotton in Bengal. Having noticed the causes of the decline of cotton cultivation for the home consumption of the villagers, and the labour of growing it complained of by the natives preventing its being an attractive crop, I shall now remark on Foreign cotton. As might have been expected in a district so long noted for cotton as Dacca, and the surrounding ones all growing it more or less, the Foreign cotton does exceedingly well, and as it has to be sown only once in several years, it does away with the Bengalee's objection of cotton being laborious to produce while its length of staple gives it a vast advantage over the short fibre of the Bengal and Dacca cottons which is so much objected to in England. My knowledge of the growing of Foreign cotton is not very extensive but I have had some opportunities of seeing its cultivation in the Dacca district and the subdivisions of Manickgunge and Moonsheegunge.

About the year 1847, the Government urged to it from home, began a series of experiments on a large scale in Bengal. An experienced cotton planter from America was engaged, great quantities of New Orleans and other species of seed were got, implements of all sorts were imported, and every requisite for a great trial of the growing of cotton was secured, lands near Sonargong, Dacca, Sabar, Manickgunge &c. were taken, so that apparently all was done to secure success and yet the experiment was a failure.

Why? Bad seed one year, want of rain another, too little money and so on, said the manager, were the cause of this, and yet he reported in another letter which I here give in full. Sir "The district of Dacca is well adapted for the growth of cotton"—and in this I quite agree, and, what may seem paradoxical, I distinctly say the experiment succeeded.

When I arrived in India in 1849, the cotton experiment was in full operation and I had ample opportunity of seeing many of the fields, each of which succeeded, but I shall confine myself to two patches of land.

The first patch was in my private garden of moderately good soil but subject to flooding in a high inundation, the seed sown was New Orleans and it covered about one tenth of an acre if so much. In fact there were perhaps twenty or thirty trees on it and although the land was occasionally weeded it was neither watered nor manured. These trees year after year were loaded with bolls and I can hardly fancy it possible that the famous American plants, with every advantage, could have looked more luxuriant.

The second patch lay outside my garden and contained about 30 acres which I and my predecessor in the Indigo factory assisted to superintend. The land was in parts subjects to inundation during a high flood, the soil was not rich, rather light, the seed, New Orleans; and no manure was applied, nor irrigation, while cattle were not strictly prohibited going into it. The Superintendent at last arrived and in his company I inspected the whole field. The trees could hardly have borne a heavier crop, but cattle walked between the bushes, while heavy jungle covered parts of it, yet the Superintendent declared emphatically, "I never saw finer cotton and that it was as good as any I ever looked after in New Orleans, I must send for the boatman to gather some of it and I shall get coolies in a few days to gather the whole crop." The boatman gathered a

small bundle of the cotton which the gentleman took off with him, and that was all that was taken this year from the field. I know what would have happened had I gathered a single boll, so the cotton fell to the ground, or was stealthily gathered by the villagers, and next year the experiment being considered a failure, the land was converted by the Talookdar (land owner) and his villagers into safflower fields.

From this I think I may say the experiment succeeded, for ample proof was thus got that forign cotton would thrive in Bengal, and also that the climate and soil of these districts could produce a heavy crop and equal in quality perhaps to the finest grown in America.

To give any information as to the profit per beegah or acre which could be got by fine cotton, or what weight in a given quantity of land was got, or whether the proportion between the seeds and clean cotton were the same as in America or not, is beyond my power and I believe no such tests were attempted. From other sources however I am able to give some clue as to the produce of foreign cotton seed sown in India which I hope may be of interest, but before doing so must notice the last kind of cotton mentioned in my list viz. the 9th, Seemul or wild tree cotton. In Bengal this Tree cotton is considered as useless, the fibre being too short and fine for any purpose except for the stuffing of pillows, while the wood is looked upon as unfit even for firewood. In Cachar however the tree cotton is of some value as each individual tree is leased out annually at from one to three rupees according to its size.

Very recently however an Englishman has discovered a means of turning it to account and probably before long what is now allowed to be lost may become a valuable article of commerce. I have often thought that mixed with other fibres it might be used for some kinds of thread, or perhaps as a material for paper or pasteboard or wadding

it might be advantageously used. However, unless some particular advantage is discovered in the Seemul cotton, it will not likely be brought into much use, as the tree is one of the largest in Bengal, takes up a great deal of space, and grows but slowly. I however mention it as one of the species of cotton in these districts.

Before entering upon the consideration of the present value of a beegah of cotton and the probable returns from the same land by having a new kind of seed sown, I would like for various reasons to say a few words about the chief crops at present raised in these districts. They are rice, mustard, safflower, jute, &c. and as it may be interesting to you to see the returns the Bengalee agriculturists get from their fields, I have got a small table drawn up by my native writers and others of the crops they chiefly cultivate. Taking the beegah, the third part of an acre (and by this standard I go in these notes) it will be seen that none of the products of these districts afford much profit, and it would seem easy for cotton to hold its own amongst them.

*Profit from a Beegah of land of different crops.*

| Name of crop. | Height per beegah of 1375 Sq. yds. of sundry products in. | | Market rate. | | | Value of crop. | | | Deduct rent cost & other charges. | | | Clear profit. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Md.* | *S.* | Rs. | A. | P. | Rs. | A. | P. | Rs. | A. | P. | Rs. | A. | P. | |
| Rice, .. | 7 | 0 | 0 | 12 | 16 | 5 | 9 | 12 | 3 | 8 | 0 | 2 | 1 | 12 | Rice and Teel are often sown together, while safflower and mustard are a cold weather crop. In Dacca often four crops are got in 12 Months. |
| Mustard, .. | 1 | 20 | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 14 | 0 | 1 | 2 | 0 | This and safflower are often sown together. This being reaped the other is enabled to thrive. |
| Jute, .. | 4 | 0 | 1 | 4 | 0 | 5 | 0 | 0 | 4 | 2 | 0 | 0 | 14 | 0 | A very exhausting crop. |
| Sunn Jute, | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | In Mymensing little is grown. |
| Safflower, | 0 | 10 | 30 | 0 | 0 | 7 | 8 | 0 | 4 | 12 | 0 | 2 | 12 | 0 | A new product in Dacca, I have tried to introduce it into Mymensing but without success. |
| Teel, .. | 2 | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | I have on good lands generally seen it sown with rice. It also forms a cold weather crop. |
| Sugar cane, | 15 | 0 | 3 | 0 | 0 | 45 | 0 | 0 | 39 | 0 | 8 | 5 | 0 | 8 | A most valuable crop and yet subject to great improvement. |

25 *May*, 1860. (Signed,) T. A. Wise.

Sugar cane yielding the highest return affords Rs. 5–8 of profit which is not much, and what is more, it is a crop that will grow only on high fine land. A casual glance at the table however does not afford a clear insight into the profits of the tenant, for in some places in these districts so many as four crops are got in one year from a single field. Thus in October, mustard and safflower are sown together, and as the former is quickly ripe it is removed in December, and the safflower is allowed to flourish, reaching maturity in March. In April and May when the rice is sown, Teel is sown with it, and as soon as it is ripe in June and July, it is pulled out, and the former is left to itself.

This is an extreme case however and if we say rice grows during the rains, giving a profit of 2 Rs. 1 anna, while mustard in the cold weather gives a profit of 1 R. 2 annas, or in all 3 Rs. 3 annas per beegah or Rs. 9–9 per acre, we see that the cultivator is better off than the table at a glance would indicate.

Now for cotton to be much grown in these districts the cultivator must have a larger profit than the above, and as it is an uncertain product and one requiring a great deal of labour, he will not care about sowing it unless he gets a considerable amount of gain; and on the returns got from cotton I shall now say a few words.

In the neighbourhood of Capassia, on the banks of the Luckia river, and which was formerly noted for its fine cotton, I have made inquiries regarding it, and am not surprised at its cultivation being abandoned, now that the price of almost every product is double what it was five years ago. The Ryots there say a beegah produces only one to one and a half maunds of cotton equal to 15 seers of cleaned cotton. The cotton, with seeds, selling at 6 per maund, gives the return from a beegah at 9 Rs. Referring to the table it will be seen that the return from any of the crops, excepting mustard and those which are

easily grown, is more than half this, and as they occupy the land only 6 months, while cotton occupies it one year and is a most troublesome crop, it is not to be wondered at that it is looked on with little favor.

Mr. Taylor, whom I have already quoted when speaking of the Dacca district, says two crops are raised in the district, "they are gathered in April and September but the first "yields the finest produce and is the one chiefly cultivated. "A good crop is estimated at 8 maunds per beegah (640℔.) "The average proportion of seeds' to wool is about 32 "seers of the former in one maund or 40 seers of the "uncleaned cotton." This is evidently a mistake, or else Mr. Taylor must mean some other beegah than the one in general use, for from my inquiries and observations few if any fields give more than 2 maunds or 160℔s. of uncleaned cotton.

This then is not encouraging as regards indigenous Bengal or Dacca cottons, but Mr. Finnie in charge of the Government cotton plantations reported in Nov. 1841 as follows :— "you see I do not reject the native cotton, Oh no, on the contrary I wish to draw your attention particularly to this indigenous plant. I now assert, and a few years will suffice to prove, that by cultivation and a gradual mixture with our cotton, the staple will become fine without partaking of the delicacy of a foreign and unacclimated plant but retain its native hardness." And again he says "For all our want is a few years of well directed exertion, and a small amount of well laid out capital, to procure industrious men as assistants and train them to carry out the orders issued from the head person in charge of each plantation." [*Journal Agricultural and Horticultural Society of India, Vol.* I.]

This gentleman then, it would seem, approves of the indigenous cotton and thinks it requires only better treatment to make it worth the planters while to cultivate it. Mr. J. P. Wise, when examined by the Committee on the colonization

and settlement of India, was asked about the Dacca cotton. Question 2,742, "Might it be procured to a considerable extent?" "Yes by encouragement I have no doubt you could increase the cultivation of cotton of that kind very considerably there." In this I agree, but my idea is the indigenous and even the fine Dacca cotton ought not to be looked to as the species for extensive cultivation in Bengal, the staple being short, not easily separated from the seed, and with the high price of all produce now a days, not sufficiently productive, even with the improved cultivation recommended by Mr. Finnie. The advice contained in a letter of Dr. J. V. Thompson to Lord Auckland in 1841 is deserving of the greatest attention, and will be listened to no doubt by every one who wishes to see cotton cultivation revived in Bengal. He said "I would by no means stop at the introduction of a more productive cotton, as the Upland Georgia, which only yields a remunerating price, a little above the cottons of India, but I conceive that efforts ought to be directed to produce a long stapled cotton of various quality, separating easily from the seeds, which would undoubtedly supersede the short stapled cottons of India and America, and which can scarcely be made useful in our manufactories without a due admixture of some long stapled cotton. Many of these cottons while they are equally productive, are double the price of the Indian and a third more than the Georgia." [*Journal Agri.-Horticultural Society of India, Vol.* I.]

Such cottons are the kind for Bengal and, being perrennial, would be eagerly cultivated by the Ryots, and I have no doubt experimental gardens carried on in a proper manner, so as to shew the people how to produce a crop in the cheapest way, would soon change thousand of acres in these districts, which are at present producing safflower, mustard &c. into flourishing cotton plantations. In this opinion I am borne out by Mr. J. P. Wise, who in his answer to question No. 2679, by the Parliamentary Committee, said

"cotton is grown in large quantities in the Tippera hills, it is likewise grown in the Dacca and neighbouring districts, but not extensively. The soil is no doubt suited for producing the finest cotton. We have cheap and abundant labour almost every where in India, and it appears to me that capital and Saxon energy is only wanting, assisted of course with a ready and remunerative market and with facilities to get to it. The soils, the climate and the requisite for irrigation, when that is required, have only to be attended to and the result must be with rail and other means of transport, an abundant supply of the finest cotton and at a lower price produced than from any other part of the world. I had cotton growing in a garden near Dacca for many years yielding three or four crops a year of the finest quality, pronounced so by men of experience, and from this I am led to think it can be grown of good quality."

A contributor to one of the last numbers of the Journal of the Agricultural and Horticultural Society of India says he got 28 seers of clean Georgia cotton per beegah, or very nearly double what the cultivators on the banks of the Luckia get.

In the proceedings of the Agricultural Society of India for 14th September 1859, I find the following statement by Mr. Tiery;—"with reference to the American cotton seed received of your Society in October 1858, I beg to state, for the information of the Society, the result of my experiment. I sowed about 50 beegahs of land in the same month, but the heavy storm in the end of that month which lasted in the Soonderbuuds for about three days, caused the river to rise so high as to break some parts of the embankments and to overflow the land by which the whole of the seedlings were destroyed. After the storm was over I sowed again the seed that was left, about five seers, on a beegah of freshly cultivated land, the quantity of cotton gathered from the beegah of land is about four maunds." Here again we

have a crop from a beegah at least double that got on the Luckia in point of weight, and being of far finer quality of more than double the value; supposing the cotton grown on the banks of the Luckia just paid all expenses, which likely it would, the doubled quantity and the more than doubled value would all be profit to the grower; taking it for granted of course that the outlay on each was the same. Mr. W. Bolston, in his evidence to the colonization committee, said in reply to question 5984. "With canals for irrigation and navigation the Indian cultivator would be enabled to produce a bale of cotton of 400 lbs. from an acre of land and deliver it at a sea port from any part of India at the cost of £ 2-8-6. as per detailed estimate, which bale of cotton would be worth £ 10 and the seed 18 shillings, leaving a profit of £ 8-9-6. per acre. Irrigation improves the quality of cotton aud brings it up to the standard of American cotton. Water never fails to lengthen the staple of cotton in India."

I regret exceedingly I cannot give exact returns of the quantity of cotton got from the indigenous plant, or from the seed sown by the Government agent; or what the cost of producing each might be, but the following calculations may not be without interest.

Inferior indigenous cotton on the banks of the river Luckia produced, we have seen, half maund at the best per beegah or taking the cotton as being worth in the bazar 6 Rs. the cultivator got as his return nine Rs. from that quantity of land. Now it is very difficult to calculate the cost of producing any crop in India, for the natives do not work by the hour and they do not bring in every item of outlay, so as to enable us to calculate exactly the cost of production, but we can find out pretty accurately the value of the crop raised. Rice gives 7 maunds per beegah or in cash 5½ Rs. Safflower 10 seers or about 7 Rs. 8 annas. Jute gives 4 maunds or 5 Rs. and so on, each however being on

the ground six months only, they represent only about half the return for the year. Or, more exactly, rice and safflower sown in a field give Rs. 13-. per annum. Rice and mustard give 8 Rs. 9 annas, cotton then giving only 9-. and being a most troublesome crop holds out no inducement to the ryot.

Put the cultivation thus and suppose we get 4 maunds per beegah, which Mr. Terry got from American cotton. We then get 12 maunds per acre which at 7 Rs. per maund is Rs. 84. From this deduct the outlay, which is above the mark, of 20 Rs. and we have a profit of 64 per acre or about 21 Rs. per beegah. A profit, if my calculation only approaches the truth, very encouraging. Mr. Bolston's calculation for cotton in Guzerat was about 85 Rs. profit per acre, or Rs. 21 above what I calculate. It is that Bengal cotton being an annual requires a great deal of labour each year to make it a crop, while these foreign cottons, requiring renewal only once in five or six years, we have a very strong inducement for the natives to take to its cultivation.

Having now shewn that cotton formerly was much grown in Eastern Bengal, that there are many kinds of it in the district, that foreign cotton has been found to succeed, and lastly that practical men have pronounced it well adapted for cotton, I shall now say a few words in conclusion on the reasons why Europeans have not cultivated it largely. This is a great argument with some against the supposition that India can compete with America in growing fine cottons. The European has tried Indigo &c. but not cotton, why is this? To answer the question we must look to the position of Englishmen in India. The purchaser of hides, jute &c. has generally had no land of his own, and no very settled appointment, so he could not well take to it. The proprietor of indigo factories has been too busy calculating the probable gains from his dye and the time it will take him to fill his purse, so that he can return with wealth to his native land. The assistants and managers of factories

have had too much occupation both for mind and body to think of experimenting on cotton, or, if not prevented by these reasons, their slender incomes never allowed them to enter upon a new field as cotton might prove to be; or may be with a little of the apathy imbibed from constant contact with the natives the Englishman has been content with his present lot and lived on in the hope of one day owning factories which would prove a very El-Dorado to him. Had more settlers been in India cotton would have gained greater attention than it has hitherto done, and we might now have been reaping the benefit of it by importing our cotton from our splendid empire in the East, instead of from the West, where even now English gold, in an indirect way, gives encouragement and wealth to the slave dealer. But a change is fast coming over Bengal and cotton may soon be revived as one of the principal products. Formerly labour was cheap in Bengal, and the indigo planter rejoiced in the fact that he could get coolies and ploughmen at such a rate as enabled him to make vast profits on his outlay, if fortune only favored him with a favorable crop. But this is altering now very fast. Labour has become both expensive and scarce, and indigo planting must soon be changed in system, or be as little profitable as in a great measure to disappear in many parts, while cotton being a product in which the women and children of the cultivator can assist us in plucking, makes me think that while the former decreases in these districts the latter will assume a position unthought of at the present day; and our merchants may sooner than they expect find their hopes realized of getting their chief supplies from India instead of from the slave States of America.

Hoping you will not criticise severely the foregoing remarks, and trusting they may suit your purpose.

I have, &c.

DURBENGOUR, MYMENSINGH: (Signed,) T. ALLAN WISE.

*25th June*, 1860.

## *Correspondence regarding the cultivation of Flax in the North-Western Provinces.*

*(Communicated by the Government of India.)*

*From* Lord H. Ulick Browne,
*Under-Secy. to the Government of India.*

*To* A. H. Blechynden, Esq.,
*Secy. to the Agri. and Horticultural Society.*

*Dated Fort William the 8th October,* 1860.

Home Dept. Revenue.

Letter from Secretary to Government N. W. Provinces, No. 138 A. dated 8th March, 1857, and enclosures.

Letter to ditto No. 2,202, dated 3rd Instant.

Sir,—I am directed to transmit for the information of the Agricultural and Horticultural Society the accompanying copy of correspondence regarding the cultivation of Flax in the North-Western Provinces.

I have the honor to be,
Sir,
Your most obedient servant,
H. Ulick Browne,
*Under-Secy. to the Govt. of India.*

---

*From* G. Couper, Esq.,
*Secy. to the Govt. of the North-Western Provinces.*

*To the* Secy. to the Govt. of India, with the Govr. Genl.

*Dated Camp Gonesh Ghat, the 8th March,* 1860.

By a letter from your Office, No. 1,122, dated the 20th October, 1854, a copy of a Despatch from the late Hon'ble the Court of Directors, No. 23, dated the 6th September, of the same year, was forwarded to this Government, in which it was requested that certain experiments for the production of the flax fibre might be set on foot in the Botanical Gardens at Shaharunpore.

2. The necessary instructions were issued; the experiments were made, and their result reported by Dr. Jameson, the Superintendent of the Gardens, in a letter dated 6th March, 1857; but apparently the intervention of the disturbances forced the subject into abeyance.

3. I am now desired by the Hon'ble the Lieutenant Governor to forward, for the consideration of His Excellency the Viceroy, the accompanying copy of Dr. Jameson's report, and also of a further communication from that Officer, No. 442, dated the 14th September, 1859, in both of which he strongly urges the continuance of those experiments on a wider footing, and suggests measures whereby he is confident that flax cultivation would be successfully introduced into parts of these Provinces.

4. It appears that not only can an excellent paying crop be obtained from the seeds alone, but that the fibre prepared under proper management would be admirably fitted for the Home market. This is proved to be the case not only by the result of Dr. Jameson's experiments, but also by the result of those conducted on a larger scale in the Punjab,— the flax which was there produced having been declared by competent Home authorities to be even superior to the Russian flax.

5. It is impossible, in His Honor's opinion, to over-estimate the importance, both to the interests of Government and the people, of introducing new products into the country; and the increasing demand in the Home markets for flax, points it out as one which it is the duty of Government to encourage. But it is evident from the documents forwarded with this letter that it is vain to hope for suc with the means at present at the Lieutenant Go disposal. Instruction from Europe is indispensa sary before Native cultivators will be able to c somewhat difficult process described by I Good seed and good machinery are both re

production of flax, which could compete with that now supplied to the Home market. The promise of reward for successful cultivation and manufacture would be needed, in order to stimulate the efforts of natives, who are not of themselves prone to adopt novel experiments. The Lieutenant Governor, having regard to the financial pressure, declined in the first instance to ask for sanction of the requisite expenditure, which at first may not be inconsiderable; but having since been encouraged by the Right Hon'ble Mr. Wilson to re-open the subject, His Honor would now suggest, for the consideration of His Excellency the Viceroy, that as proposed by Dr. Jameson, measures be authorized for the engagement of a couple of competent European Instructors, and the importation of the necessary machinery and seeds.

6. But at the same time the Lieutenant Governor is averse to the idea of burdening Government with the continued supervision of this work. He would leave it to private speculation to carry out to perfection the scheme when once fairly started. If, as is confidently expected by those who are competent to judge, it be proved by the result of the measures now recommended, that flax can be grown with profit to the commerce both of India and of England, then the inhabitants of either country will only have themselves to blame if they neglect to improve the opportunities offered to them. There can be no doubt but that private enterprize from Home at any rate would speedily follow up the undertaking if its advantages be once clearly brought to notice.

FERRED for disposal to the Home Department at ency.

---

*From* W. JAMESON, ESQUIRE,
*Supt. Botanical Gardens, North-Western Provinces.*
*To* C. B. THORNHILL, ESQUIRE,
*Officiating Secy. to Govt. North-Western Provinces.*
*Dated Saharunpore, the 6th March,* 1857.

Having carefully perused the 35 reports on flax cultivation in the North-Western Provinces, received with your letter No. 1742 A, dated 23rd September last, I beg to offer a few remarks.

2. All the reports under consideration show that flax cultivation attracts but little the attention of the agriculturists of the North-Western Provinces, as it is considered a non-paying crop, or rather as the return received from it is so small as scarcely to remunerate the grower. In almost every district the flax cultivation is carried on to a small extent for the oil yielded by its seed, and nowhere is any use made of the shove and stem further than occasionally breaking it up, and giving it with the straw of cereals to cattle, or using it as fuel. It is generally met cultivated with other crops forming the edges of fields, and no care taken to increase the length of straw by thick sowing; on the contrary, Natives only give a few seers to the acre. In the Punjab and Cis-Sutlej States, it is frequently met with covering considerable tracts, and in my late tour I observed that it was extensively cultivated, particularly in the Hooshearpore District, and that too caused no doubt by the encouragement given to the cultivation by the Civil Authorities. But that it will not yield a fibre fitted for marketable purposes is a great mistake and the time is not far distant when railways shall traverse the North-Western Provinces in all directions, it will be absolutely necessary for the Collectors of Districts to direct the attention of the agriculturists to other crops than cereals, to enable them to pay their revenue, and there

is no one which deserves greater attention than flax, owing to the enormous and increasing demands for it in the Home markets. The greatest drawback to its extensive cultivation has been the means of rapid transmission to the different ports, but with railways this difficulty will be removed, and good markets available.

3. For two consecutive seasons an experiment on flax cultivation has been tried both at Saharunpore and in the Dehra Dhoon, in compliance with the orders of Government. When orders were first received to try the cultivation, it was too late in that season, still the experiment was tried with partial success, a small and successful one, as far as the growth of the plant was concerned, having been carried on for years in the garden. It was again tried in 1855-56 with complete success, and the return from the yield of seed alone gave a profit.

4. *Land fitted for Flax Cultivation.*—All kinds of land are not fitted for flax, on the contrary, only the rich loam met with in the neighbourhood of towns and villages, as in this country Zemindars will not manure their lands sufficiently to enable them to yield a good crop, particularly if that crop is an exhausting one, barring sugar, which is always highly manured. Flax is an exhausting crop, and therefore the land on which it is grown requires to be well manured. In the Dehra Dhoon the flax experiment failed, and was therefore discontinued, as the dry stoney and porous soil of that locality is not fitted for this kind of crop.

5. At Saharunpore the following was the plan pursued; Five acres of well drained and irrigated land were selected for the purpose of trying the experiment. This land was easily irrigated by one of the Rajbuhas leading from a branch of the Eastern Jumna Canal. During the rains it was ploughed three times, and all the weeds carefully removed. It was then strongly manured, or to the extent

of 20 loads or 200 maunds per acre, and again ploughed and well pulverized with the Mairah, the seed was then sown partly broadcast, and partly in drills, to ascertain the value of the different kinds of sowing very thickly, *viz.*, 1¼ maund to an acre, and again smoothed with the Mairah— (the broadcast gave both a better and a heavier crop). It was then thrown into small beds 15 feet by 20, for the purpose of rendering irrigation more easy. Fifteen days after sowing it was irrigated. Before the first watering much of the seed had begun to germinate, though it was not general; as soon however as it was irrigated it came up very thickly. A month afterwards the crop was weeded, care being taken to weed in one direction, from East to West, so that any plant levelled by the weeders might have the advantage of the North-West winds, which generally prevail in the cold weather, and thus be again raised. This is well worthy of attention, as the young and tender plants, if much bruised and twisted by careless and irregular weeding, and unassisted by the prevalent winds, never again rise, and lying on the ground, wither and die. The crop was again slightly weeded—the weather being dry and warm, it was irrigated every three weeks, *i. e.*, received two general waterings in October, one in November, one in December, and one in January, or in all, was five times irrigated. Had there been rain, which generally occurs in the months of January and February, three waterings would have been ample, but irrigation is essential to ensure a good and paying crop, and no land which cannot be irrigated ought to be sown with the flax.

6. The following were the results: The quantity of seed sown per acre was 100 ℔s or 1¼ maunds, or about 6¼ maunds to the five acres. The yield was 35 maunds or 7 maunds per acre; the yield of straw when dried 82 maunds, or equal to 16½ maunds or 4 maunds of fibre 300 ℔s, per acre, the fibre being in the proportion of one to four to the

wood or shove. Height of plants from Russian seeds varied from 3½ to 4½ feet, and from Native or Indian seed from 2 to 3 feet. In the Table appended the results are shown in a general form.

7. *Pulling.*—As soon as the shove or stalks began to show a pale yellowish colour for two-thirds of their height from the ground, and the seeds' vessels or bolls assume the same colour, the crop was considered ready for pulling. This was on the 15th March. But the ripening of the crop depends much on the weather,—as if cold and cloudy, it will not ripen until the end of March, and if sunny and warm, about the beginning of the same month. In pulling, the plants were carefully uprooted; all those of the same lengths gathered together and parted in small bundles. By thus collecting them in bundles of equal size much labor is saved to the manufacturer. By some parties the plants are pulled when quite green, and the fibre yielded is finer, but then all the seed is lost. Again, when the plant is not pulled until the seeds are quite ripe, or the whole shove or stem and bolls are of a pale yellow colour, then the fibre is coarse. The middle course therefore recommended is the best to follow, as after being pulled down the seeds ripen. The plants having been carefully uprooted and tied up in small even bundles soon dry. In three or four days they are sufficiently so for packing into stalks, or for rippling or removing the seeds.

8. *Rippling.*—As seeds are considered the most valuable part of the crop in this country, rippling was done as soon as the plants were sufficiently dry. The implements used for the purpose consist of a number of small triangular pieces of iron from ½ an inch to an inch in thickness, and from 12 to 18 inches long which are made to taper to a point three inches from the top. The small pieces of iron are then fastened to an iron plate 3-16th of an inch asunder at the bottom, and ½ an inch at the top.

The iron plate may be from 4 to 5 inches in breadth, and can be screwed into a flat piece of wood on which the operator sits, and keeps it steady when engaged in removing the seeds. To receive the bolls as they are rippled off, a basket was placed. The following is the method in which the rippler went to work. The sheaf or bundle being untied, the rippler then took a handful, and holding it about an inch from the root with the left hand, and with the other hand a little higher spreads it out like a fan, and then drew it through the combs or ripple. This was repeated three or four times to remove all the bolls. On being done, the bundle was tied up and laid aside, great care being taken to keep all the stems straight.

9. *Drying the Bolls.*—The bolls were then thinly spread out to dry, and when sufficiently so, the seeds were easily removed by thrashing.

10. *Watering.*—As soon as the bolls containing the seeds were removed, the straw was ready for steeping. This is best done in small tanks varying from 10 to 20 feet in length by eight in breadth, and three to four feet in depth; into these tanks water is allowed to enter and if a small stream be available, which can always be obtained in canal districts, it ought to be allowed to pass through the tank. Take the bundles and immerse them loosely, but carefully in one direction, slightly sloping with the root ends below. Place on the bundles sods as is done with sunn, or any thing else available to keep them under water, and as the fermentation proceeds, it will be necessary to add additional weight to keep them immersed in the water, the gaseous water causing them to become much more buoyant, and as it begins to cease, a portion of the weight must be removed so as not to sink them too deeply; according to the heat of the weather will be the length of time required for steeping. But as a general rule 48 to 72 hours will be ample. To ascertain that they have been

steeped sufficiently long, the best tests are the following: Break the shove or wood part in two places, six or eight inches apart near the middle, and take hold of the wood, and if it will pull freely downwards, without breaking or tearing the fibre, and with none of the fibre adhering to the stem, it is ready to take out of the water. This trial must be made every two or three hours after the fermentation has subsided, as at times the change is rapid and decomposition may take place, and thus injure the fibre. In steeping plants in this country, in order to remove the fibrous portion from the wood, Natives are exceedingly careless, and thus it happens that fibres collected from the same plants are seldom found of an uniform colour and strength.

11. *Spreading.*—As soon as the straw has been sufficiently watered, it is to be carefully spread out on the ground, and for this purpose, select places as free of weeds as possible, let it be laid evenly, and turned once or twice daily in order to prevent it acquiring different shades of colour by the action of the sun.

12. *Lifting.*—Three days in most instances is ample for drying. If the weather be cloudy, it may require more, and if rain falls, which however rarely happens in the North-Western Provinces in March, five or six days may be required. Let the bundles then be tied up. A good test to ascertain if it be properly dried and fit to lift, is to rub the stalks from the top to the bottom, and when the wood breaks easily, and separates from the fibre, leaving it sound, it has been sufficiently dried, Another test is shown by a large proportion of the stalks forming a bow and string from the fibre contracting and separating from the woody stalk. But the most certain of all tests is to prove it by the hand break, by trying a small quantity in it. In lifting keep the lengths straight and the ends even, otherwise great loss will occur in the breaking and scutching.

13. *Breaking and Scutching.*—This to prove economical must be done by machinery. The machine made by the Rev. Mr. Woodside is very unwieldy, and not at all well fitted for the work, and before a proper experiment can be made, in order to test the value of the fibre produced in India, it will be necessary to procure from England a set of the implements now there in use, with the hand, and a machine made by two common rollers, or with the common break consisting of three triangular planks fixed to a frame—A quantity of fibre might be produced in one day, but it is doubtful if the fibre would not meet with approval in the English market.

14. I forward a specimen (four seers) of the fibre thus procured. It is of a good strength, but still dirty, unequal in length, and of bad colour, but the staple is of good length. It shows however that by an improved method of watering and preparing, a superior article might easily be turned out. The quantity of fibre to the straw is as stated one to four. I have still a large quantity of flax straw in store for preparing, but which I am reserving for a better kind of implement.

15. That the North-Western Provinces in many places, paticularly those districts traversed by the different canals, such as the Meerut and Rohilkund, and a part of the Delhi Divisions, are admirably fitted for flax cultivation; I am confident from the results of the small experiment conducted by us for two seasons. It has also been proved by us that the Russian seed gives a far superior fibre both in length and fineness, that the yield even of seed is sufficiently great to remunerate the grower, provided that proper attention be paid to the sowing, the yield of flax is considerable, and all that is required to make it an useful crop in India are some good Instructors to show how the fibre is to be prepared and fitted for the market, and good seed and machinery. To encourage flax cultivation in

Ireland, the Home Government annually allow the Royal Flax Society Rupees 10,000, and by this Society upward of £ 10,000 has been spent in twelve years in salaries to Instructors, &c. If, therefore, the cultivators and preparers of flax in Ireland, where all the finest kinds of machinery are available, require Instructors, how much more so is it necessary that means be adopted by the Indian Government to procure some expert Europeans from Europe to teach Natives how to prepare fibre. Until this is done, it is in my opinion an useless waste of money to attempt to carry on the process with success. We have shown that the plant can be grown so as to pay all its expenses, and at the same time afford remuneration to the grower from the seed alone, proving that it is not necessary, as mentioned by Mr. Commissioner Fraser, to look to Bengal for land to cultivate the plant successfully, and with the immense advantages now derived by the North-Western Provinces by irrigation from the Ganges Canal, there is nothing but energy and perseverance required with a little aid from Europe in the form of Instructors, seeds, and machinery to make it a crop of the utmost importance to the agricultural community.

16. Mr. McLeod informs me that the Punjab Government have for some time employed an European Flax preparer, and that by him flax of a very superior quality has been prepared; nothing is therefore wanting to bring about the same result in the North-Western Provinces but expert hands, and were Instructors sent from Europe to teach Natives the processes of manipulation, it would soon be learned by them.

17. An experiment so as to pay, *viz.*, of 100 acres, might be tried in the Saharunpore District, Meerut, Delhi, Bijnour ditto, Cawnpore ditto, and to each of these Districts two Instructors should be appointed, I say two, as one is so liable to fall sick. To the Factory a few Natives ought to

be appointed as Assistants to the European Instructors, and as soon as they were competent to make good marketable flax, they might then be given independent charges, and made both to grow and prepare flax themselves. For the best flax prepared rewards ought for three or four seasons to be offered, and the Natives employed by Government allowed, when acting independently, to compete. Of the flax prepared a large sample should annually be sent to Europe, in order to be reported on, and the remainder, as also the seed, sold to pay the expenses of the experiment.

18. To any parties desirous of trying the cultivation there are now a large quantity of seeds, partly Russian and partly country, available.

19. I have purposely delayed transmitting this report, in order that I might personally communicate with the Financial Commissioner of the Punjab, Mr. McLeod, in order to ascertain what had been done in that quarter, and the success attending the cultivation, and also see the state of the flax crops in the Cis and Trans-Sutlej States.

20. As ordered I return the reports of the different District Officers of the North-Western Province.

*TABLE showing the results of an experiment on Flax cultivation conducted in the Saharunpore Botanical Gardens in* 1855-56.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Land under cultivation. | Manuring per Acre. | Seed sown per acre from 1st Sept. to 3rd October. | Watering. | Weeding. | Height of plants from Russian seeds. | Height of plants from Country seeds. | Yield of seeds per acre. | Yield of straw per acre when dried. | Yield of fibre per acre. | Remarks. |
| 5 Acres | 200 Mds. | $1\frac{1}{4}$ Mds. | 5 times. | Twice. | From $3\frac{1}{2}$ to $4\frac{1}{2}$ feet | From 2 to 3 feet | 7 Mds. | $16\frac{1}{2}$ Mds. | 4 Mds. | |

SAHARUNPORE:
*The 6th March*, 1859.

(Signed,) W. JAMESON,
*Supdt., Botanical Gardens, N. W. P.*

*From* W. JAMESON, ESQ,
*Supt. Botanical Gardens. N. W. Provinces.*

*To* F. B. OUTRAM, ESQ.
*Offg. Under-Secy. to Govt. N. W. Provinces.*

*Dated Camp Kalaghir, Dehrah Doon, the* 14*th Sept.* 1859.

I have the honor to acknowledge the receipt of your letter No. 1,336, dated 16th ultimo, with enclosure, and in compliance with the orders therein contained, I transmit copies of such correspondence as has already taken place in my Department on the subject of the cultivation of flax in the North-Western Provinces.

2. The 35 letters from the several Officers in charge of Districts were returned by me, as ordered, to Secretary to Government with my letter No. 159, dated March 6th, 1857, and as none of them contained any information worthy of notice, no general notes of their contents were kept. Their contents were to the effect that flax cultivation was unknown, or considered a crop unworthy of cultivation in their districts.

3. By the small experiment made by me for two seasons consecutively, I found that flax might not only be made an excellent paying crop from the seeds alone, but that the stem or shove, if properly scutched, would be admirably fitted for the Home market, but before this can be brought about, it would be absolutely necessary to import good instructors from Europe. This the Punjab Government have done with partial success.

4. But the experiment which was then going on so successfully has been relinquished at the very time when it ought to have been prosecuted with renewed vigour seeing it had not actually done so then. But when millions of pounds sterling were at stake—when the improvement of thousands of acres lying waste were under cosideration—when the Zemindars were crying out for a crop to cultivate which

would find a ready sale, and enable them to pay readily their revenue to Government, the markets for grain being glutted—when such a crop was urgently required, Government, instead of using their utmost exertions, through means of their officers, to meet the wants of the agricultural community, stopped short, because the experiment in two years had not paid all its expenses.

5. In Britain there is an immense demand for flax fibre which is only met partially by the cultivation in the country, particularly Ireland, and by importations from the Continent of Europe.

6. To encourage the extension of the cultivation in Ireland, and at the same time to improve the fibre prepared, Her Majesty's Government granted to the Royal Flax Society £1,000 per annum for ten years, to enable them to pay the wages of Instructors who were sent to the best growing districts to teach the farmers the most improved method of growing, and the preparers of fibre the best method of steeping, scutching, &c.

7. If in Ireland such was deemed necessary, in order to enable the Home grown fibre to hold a good position with the imported fibre, how much more necessary is it to have a few good Instructors imported from Europe to teach the Natives of this country, provided that Government really wish flax fairly tried as an agricultural crop in India.

8. In paragraph 17 of my letter No. 159, dated 6th March 1857, I have recommended a plan to be pursued which might now be modified, and the number of instructors confined to four—two for the North-Western Provinces, and two for the Punjab—half measures would only end in failure and loss of money. But for such an experiment to succeed and be useful, it must be persevered in, as the agriculturist, though he has an immense market open to him for his produce, yet still that market is in a measure occupied, and if he does not produce a fibre equal to that of Russia, Belgium, &c., he

will find that his produce will meet with a dull sale, and this possibly scarcely reward him or pay his expences. But with good Instructors and good seed I am confident that in the Punjab and North-Western Provinces as good flax may be produced as in any other part of the world.

---

*To* G. COUPER, ESQUIRE,

*Secy. to the Govt. of N. W. P.*

*Dated Fort William, the 3rd October,* 1860.

Home Dept.

No. 138A, dated 8th March 1860

SIR,—I AM directed to acknowledge the receipt of your letter noted in the margin forwarding Dr. Jameson's Report of March 1857, on the cultivation of flax in the North Western Provinces, and on the result of an experiment on a small scale conducted in the Seharunpore Botanical Gardens in 1855-56.

2. Dr. Jameson expressed himself confident that many parts of the North Western Provinces are admirably fitted for flax cultivation, and that the plant may be grown so as to afford a remuneration even from the seed alone. He considers however that instructors are required to show how the fibre is to be prepared and fitted for the market, and he recommends that measures be taken for the engagement of two competent European Instructors, and for the importation of some good seed and machinery.

3. In reply I am desired to draw attention to a Report on the flax operation in the Punjab during 1855, which will be found in the Selections from the records of the Government of India (Foreign Department) No. XV p. p. 75 *et seq.*, and also to transmit copies of the papers noted in the margin, from which it will be precieved that the question whether

Extract paragraph 10 of Revenue Despatch from the late Court of Directors, No. 17 of 1857, dated 4th November.

Foreign Consultations 20th May 1859, No. 79 to 81.

Letter from the Punjab Government to the address of the Secretary in the Foreign De-

partment, No. 734, dated 26th October 1859, and enclosure.
Secretary of State's Revenue Despatch, No. 10 of 1860, dated 8th February.

good flax fibre can be produced in India has been fully solved in the Punjab, and (to use the words of Mr. Roberts,) "has passed from speculation and surmise to fact."

4. This remark the Governor General in Council is disposed to regard as equally applicable to the North-Western Provinces as to the Punjab, so far at least as concerns the obligations laid upon the Government of becoming pioneers in the cultivation of flax. The experience of success gained in the Punjab should, he thinks, be sufficient to stimulate private enterprise to seek a field for its operations in the Dooab, as well as in the adjacent districts under the Punjab Government. It is to be observed that Dr. Jameson's Report is dated March 1857, since which the practicability of cultivating flax for the English market at a good profit has been clearly established in the Punjab, and though Dr. Jameson in his letter of the 14th September 1859, repeats his recommendation for the introduction of instructors, it is shown on the other hand by the satisfactory and conclusive report of Mr. Roberts, which was written only a few weeks earlier, that the Punjab can now be left to its own progress unaided by Government, and if this is the case in that Province, it can hardly be that imported instructors are requisite for the North-Western Provinces. If the assistance of Government is still thought necessary in order to furnish instruction to the growers of flax in the North-Western Provinces, it would seem worth considering whether Mr. Cope or some other experienced person from the Punjab might not be made available.

5. So far as any aid from Government may still be necessary to encourage this branch of industry, the Governor General in Council is disposed to believe that it may be most usefully afforded in the following manner:

*1st.*—By collecting and publishing as speedily as possible

the best information on the subject. This may probably be best done through Agricultural Societies, Government taking numbers of any thing they publish on the subject, for distribution in quarters where the transactions of the Society do not of themselves make their way,

*2nd.*—By giving aid in various ways to private experiments, *e. g.* to get good seed, or to import machinery, passing it duty free.

*3rd.*—The chief difficulty is to make flax out of the straw after the latter has been obtained of good quality, and there being generally a few men to be found in every European Regiment, Belfast men especially, who know something of this art, the Government, with the concurrence of His Excellency the Commander-in-chief, might perhaps procure the services for a few weeks of such men in that capacity.

*4th.*—Rewards to be given through the Agricultural and Horticultural Society for the best samples of produce, not samples in very small quantities, but a given number of Bales or Cwts. The sums placed at the disposal of the Societies should be large enough to admit of division, so as to give several prizes, and to be objects of importance not only to him who can produce the best, but to those who secure a useful but rather inferior degree of success.

6. I am desired to state that the Government will be prepared to sanction a reasonable expenditure for any of the purposes above indicated.

I have &c.

(Signed,) W. GREY,

*Secy. to the Govt. of India.*

---

*Notes on the Tussur moth. By Capt.* THOMAS HUTTON.

MY DERR SIR,—I have just read Mr. Pringle's paper, on the tussur moth of Palamow and hasten to correct an error which might mislead an entomologist in regard to the description of the male insect which is stated to have "a large *red* dot on each wing."—A batch of very fine large cocoons kindly forwarded to me by Mr. Deveira who succeeded Mr. Pringle at Palamow (by far the finest tussur cocoons I have yet seen) produced moths of the usual appearance, the males being any thing but small and having the vitreous or talcose ocellus in the wings like those from other parts of India. The only difference I can yet perceive between the Palamow and Bhagulpore species (or rather variety) is that the size of the former exceeds that of the latter and no two moths possess the same colouring. The males vary from deep fulvous to buff, and the females were generally of deep mouse colour, bluish slate grey and brownish buff, but not one bright yellow one, as is the case with those from Bhagulpore, Hazareebagh, Darjiling Tarai, Punjab, Pondicherry and Soonderbunds. The insect is certainly in point of size the finest of all, but the colouring is as variable as in the common Dahlia, and how to account for it I know not, unless it can be attributed to food, domestication,, or intermixture of two distinct species. Red spot on the wing of either male or female there is not, and when I first read Mr. Pringle's note some months ago I was induced to think that the "*red spot*" indicated *Antheræa Perotteti* but, as before said, the moths from Mr. Deveira's cocoons were all *Anth. Paphia,* as at present recognised.

The cocoons from Hydrabad, kindly forwarded by you, I regard as the *worst* of all I have yet seen, but as they were dry I have not been able to ascertain whether they are identical with the Bengal varieties or not. Col. Sykes says the

*Kolisura* (Anth. Paphia,) of the Dukhun, feeds among other things upon the *Mulberry*! I have tried the caterpillars of the tussur of our side over and over again and never succeeded in making them touch the leaf, so that it is just possible the Kolisura may be distinct, unless, which is not unlikely, the Colonel was mistaken!

The Pondicherry variety appears to be identical with that of the Punjab. The cultivated cocoons from Seonee sent by Mr. Sterndale are very small also, and show great degeneracy, the wild cocoon from the same place being far larger, though nothing equal to those from Palamow, Bhagulpore or Darjiling Tarai.

A few cocoons of the *Bombyx Mori* received sometime ago from Mr. Perottet of Pondicherry, and said to be the Milanese variety, appears to me to be nothing more than a *degenerated* sample of the Cashmere stock. The Southern coasts are too warm for this species. That climate has great effect upon it may be shown by the fact that the eggs sent to Pondicherry by Mr. Cope hatched out of season and the worms failed to spin cocoons; eggs of the species deposited at Mussooree and sent to Pondicherry, Mr. Perottet informed me were far longer and better formed than those sent by Mr. Cope from the Punjab, but they *never hatched at all!* It is purely a Northern species and I should not advise you Southerns to attempt its introduction for you will make nothing of it. In the North it is a splendid worm and with common care will always be valuable.

MUSSOOREE:
31*st October*, 1860.

## *Correspondence regarding the Cultivation of Cotton in the Sunderbunds.*

*(Communicated by the Mutlah Association.)*

*To the* SECRETARY TO THE AGRICULTURAL AND HORTICULTURAL SOCIETY.

DEAR SIR,—In submitting the accompanying correspondence on the cultivation of cotton in the Sunderbunds to your Society it may be useful to offer a few remarks by way of summary of the evidence collected; the conclusions I have come to being also confirmed by my own observations on the experiments that have been made in the vicinity of the Mutlah.

1*st*. It has been satisfactorily proved that cotton of very superior quality can be grown in this locality, of both short and long stapled varieties; the samples that have been sent to the Mutlah Association, as well as to your Society, are sufficient evidence of this.

2*nd*. It is also sufficiently proved that the plant will not thrive on the low marshy lands, more or less saturated with Salt-water from the rivers and creeks, of which the principal part of the Sunderbunds is composed. Even where such ground has been bunded, and the salt-water excluded for several years, it is doubtful if the plant would succeed in the lands, as such remain so long saturated with moisture during the rainy season, and it is so difficult to sweeten them from the saline drainage which naturally percolates towards them from the higher ground for many years after being reclaimed. On such ground, paddy is the only crop that has yet been found to succeed.

3*rd*. But all agree that fine crops of cotton may be grown on such lands as have been well raised and sweetened by the action of the rains washing out the saline impregnation. Two or three rainy seasons, acting on ground raised 3 feet.

or perhaps less, above the average level of the locality, seems to suffice for this. The climate and soil appear to be all that could be desired. I may mention in corroboration of this that the grantees of lot 50, the grant which adjoins that on which the new Mutlah port is situated, while clearing their land two years ago, found cotton growing wild amongst the jungle; not that this was likely to have been indigenous, but no doubt the relic of some former and long forgotten cultivation which had here found congenial circumstances for its propagation.

*4th.* The question then arises, can ground sufficiently raised for the purpose be procured? At present such is found only in small detached patches, principally where raised in former years for salt manufacturing purposes; and the extent of these spots would be quite inadequate for a systematic or extensive cotton cultivation. The only method would be to raise the ground artificially for the purpose; and whether the expence of doing this would be compensated by the returns of the crop is a question which awaits the test of experiment. Mr. Hill, in his letter of 14*th* September 1859, estimates the expence of raising a square beegah 3 feet high, with earth dug from trenches on its four sides, at Rs. 102:—but the object could be obtained no doubt at a much less cost by adopting some more comprehensive plan, such as the one he suggests for raising the margins of the quadrilateral spaces formed by the creeks, so as to form a broad bund enclosing several hundred beegahs: this would serve the double purpose of providing a most effective bund and a large area suitable for cotton cultivation, or indeed for any other crop which could be raised in lower Bengal.

*5th.* Some experiments of this kind would seem to be well suited to the objects of the Cotton Supply Association; for if it can be proved that good cotton can be raised economically in the Sunderbunds the field that they would afford for it would be vast indeed. The main draw-

back at present is the unsatisfactory nature of the land tenure, and the disposition shewn by Government to deal harshly with the grantees, and to confiscate all grants the holders of which fail to comply to the letter with the often difficult terms of clearance &c. which must be a great discouragement to any enterprize or outlay of capital in the improvement of these inhospitable wastes. But should Lord Stanley's intention of granting the fee simple in the estates to settlers be carried out, the question under consideration will well deserve the attention of the enterprising European planter.

I am, &c.,

S. H. Robinson,

*Secy. Mutlah Association.*

Calcutta:
*November* 10*th*, 1860.

---

*Circular to Cotton Growers.*

The Committee of the Mutlah Association, being of opinion that the growth of cotton in the Sunderbunds has become a subject of great importance, and that it should continue to form one of their principal objects to promote it, have directed me to collect from such Members and friends of the Association as may have given attention to, or made experiments in the cultivation, all and every information that may aid them in arriving at correct conclusions as to the best modes of cultivation and the facilities afforded by the Sunderbunds for the production of this valuable staple.

The Association believe that by comparing the results of experiments in different localities made with different varieties of seed, and conducted by different modes of cultivation, much valuable information may be collected which they might diffuse amongst cultivators for the general benefit, and thereby promote the general progress of the work.

I shall therefore feel obliged by your furnishing me with the results of such cultivation or experiments as you may have made together with samples of the produce.

The data principally required will be,

1. Discription of the locality.

2. Breadth of the surface cultivated.

3. Length of time the ground was cleared and bunded previous to cotton cultivation.

4. Varieties of seed used.

5. Ground how prepared.

6. Produce of cotton by weight.

S. H. ROBINSON,
*Secry. Mutlah Association.*

CALCUTTA:
1*st January*, 1859.

---

*To* S. H. ROBINSON, ESQ.,
*Secretary Mutlah Association.*

DEAR SIR,—With reference to your communication bearing date the 30th March, I beg to say that as I shall shortly proceed to Europe, I have hardly time to dwell at large upon the points indicated in it, and therefore I shall content myself with giving you my general opinions upon the subject of cotton cultivation in the Sunderbunds. I wish the pressing nature of my avocations had afforded me time to make experiments as regards cotton cultivation in the Sunderbunds upon a large scale. But being unable to do that, as a great deal of my time which should in any other country but India have been devoted to the quiet pursuits of agricultural improvements, was frittered away in the anxieties and troubles of collection and settlements: I can only give you the slender results of experiments made under great disadvantages; results not at all satisfactory to my mind, experiments not upon a scale that is commensurate with the greatness of the idea. It has abundantly appeared

from the experiments that have been made, that the soil and climate of the Sunderbunds of Bengal are adapted for the cultivation of the best varieties of cotton, and that notwithstanding their low level they could by the judicious application of draining instruments, such as pumps and other appliances, be rendered available for all practical purposes. It occurs to me that the experiments that have been hitherto made have been altogether conducted upon the nursery plan, and therefore we can hardly imagine what would be the nature and the amount of the difficulties, and the actual outlay of capital that would be required when the plan would be carried out upon a large scale; for I am firmly persuaded that in India especially the introduction of a new machine or of experiments in agricultural improvements would be as difficult as the introduction of a new idea. Therefore I should judge, as far as one could theoretically, that the best plan would be to have it cultivated under a system of advances, and that under the management of an English Superintendent. It also occurs to me in connection with this subject that the whole of a Sunderbund lot should not be devoted to the cultivation of cotton, but that a portion of it should be left for the purpose of raising paddy; otherwise the very system of advances might become ruinous. However I state this with great hesitation and under correction.

It is necessary as far as my experience in the matter extends, that the ground upon which cotton is cultivated should be broken up or divided into ridges, and that it also should be artificially raised, and that the seeds should be sown in the Bengali months of "Kartick" and "Agrahayun" corresponding to the English October-November and November-December, and the ground should be well prepared by the admixture of sand, thus making it a compost of sand and clay: that the seeds should be sown 3 feet apart in holes to the extent of 3 or 4 seeds in each hole, that the

roots of the cotton trees should be well watered, and that the ground should be kept perfectly dry and drained. I beg herewith to send for the inspection of the Association the sample of cotton grown upon my estate.

Yours faithfully,

GANNENDRO MOHUN TAGORE,

1*st April*, 1859. *Sunderbund Lot*, 68.

---

*Report to Mr.* BLECHYNDEN, *dated* 12*th July*, 1859.

As regards our experiments in cotton as yet I am sorry to say they are a failure. As soon as the heavy rains come on, the low lands become completely saturated, and the plants rot away. I went over Mr. Agabeg's plantation, where the plants have got on exceedingly well. I found the lands to be about four to five feet higher than those of his Soondurbund grant lot 7 and composed of a black peaty and sandy soil. To me it appeared as if the plants preferred the darker of the two soils, which abounds in the Soondurbunds, and is composed of decomposed plants, shells &c. From the above I think cotton would grow luxuriantly in the Soondurbunds, but that the lands require to be raised at least three feet above the present level of the Soonderbund soil. In fact I have observed that where-ever the lands are *high* and *fresh*, such as fresh salt Bhutar or mounds, land round tanks &c., which are far from inundation, the plants thrive luxuriantly, and grow to the height of five to six feet. I have a great objection to ridges, as the lands thus raised become hard, and baked during the hot season, and the drains between them during the rains are perfectly saturated, become cess pools for water, and thereby cause the destruction of the tap root of the cotton plant. I am certain if the lands be raised, cotton will answer, the only question will be, will the plant bear the expense incurred for raising. If the lands were raised, hemp

and flax might also be grown, as both these plants, from the few experiments tried by myself, prefer lands similar to that of cotton.

T. Hill.

---

*To* S. H. Robinson, Esq.,
*Secretary Mutlah Association.*

Dear Sir,—With reference to your letter of the 30th April last, I beg to state for the information of the Mutlah Association the result of my experiment. I sowed a large tract of land in October last, with Orleans cotton seed, but the heavy storm in the end of that month, which lasted in the Soonderbunds for about 3 days, caused the river to rise so high as to break some parts of the embankments and to overflow the lands, by which the whole of the seedlings were destroyed. After the storm was over I sowed again the seed that was left on a biggah only of freshly cultivated land, the plants thrived well, the pods commenced bursting from the beginning of April to June last, and the plants look healthy with fresh pods at present. I send you a seer of the said cotton as sample for the inspection of the Mutlah Association.* This year I am trying the Sea Island cotton seed the result of which I shall let you know. The following is the required particulars:—

Grant Lot 104 called Konkree, situated near Tankee, more on the north east, the river water of which remains sweet 8 months in the year.

1st. Bunded high land, cleared about 4 years ago and regularly sown with paddy.

2nd. One biggah of land 80 square cubits.

3rd. Five seers of Orleans cotton seed.

4th. Sowed in the end of October, 1858.

* A sample was also sent to the Society and reported on. See *ante* p 418.—*Eds.*

5th. Land ploughed 3 times and kept free from grass &c.

6th. The produce of cotton with seed 4 maunds and no doubt the next crop will increase much.

I am, &c.,
L. TIERY.

CALCUTTA, CIRCULAR ROAD:
*5th September*, 1859.

A. H. BLECHYNDEN, ESQ.,

MY DEAR SIR,—With reference to the information required by the Committee of the Mutlah Association in their letter of the 30th ultimo, and which you forwarded me, I have much pleasure in affording them the little I have learnt from experiments tried by myself in the Soonderbunds.

1st. Discription of locality. The Soonderbund lots, especially those of the 24-Pergunnahs, may be considered and are in fact much about the same, the lands are about the same low level, the soils of the same saline quality, overgrown with the same low brush wood of Cawra, Ban, Geow, and Gurran, and are all inundated during the spring tides with salt water. During the months of March, April, and May the lands become so saline, that their layers of salt are formed on the surface of lands bunded even for a period of some 4 or 5 years. The lots in the Soondurbunds east of Kallygunge up to the Balissur river, or what is properly the Jessore Soondurbunds, are low marshy lots, intersected with fresh water streams. These lots are also inundated during the spring tides, but owing to the rivers being fresh, no harm is done either to the crops or lands, in fact the lands are benefited by the repeated inundations, and become more fertile; the jungle is also of a different species, the grants being covered with the Soondry Ban, Cane, Cowra, Gollputta, and Null or long reed grass, from which natives make the durma mats so much used amongst them. The paddy however grown in these parts of the

Soondurbunds is much coarser, and inferior than that produced in the 24-Pergunnahs, the population is scanty, and labor is difficult to be procured.

The Backergunge Soondurbunds, or those lots east of the Balissur up to the Megna, are the highest grants of lands in this Delta of the Ganges. This portion of the Soondurbunds is also intersected by large fresh water streams, .the lands are much above the level of the rivers, seldom inundated, and therefore require no embankments. The jungles here are composed mostly of forests of large trees, and have little or none of the low brushwood found in the 24-Pergunnah Soondurbunds. These districts are also thickly populated, and labor is cheap. The experiments in cotton have, however, mostly been tried in the grant in the 24-Pergunnahs.

2nd. Breadth of the surface cultivated.—I prepared last year about 100 beegahs on the low-lands, and about some 20 beegahs on the high lands, situated in the middle of lot 42. These high lands that are met with in some of the lots, never exceed 20 beegahs, seldom average above 5, and therefore cannot be depended on.

3rd. Length of time the ground was cleared, and bunded previous to cotton cultivation. The lands in lot 42 have been bunded, and cleared for nearly the past 3 years, and I trust soon the lands will be sufficiently freshened to allow me to try experiments with success, for as long as the lands are so extremely saline, it prevents the seeds from germinating. I beg to copy extracts of my letters of 21st August, 9th November, 18th January last, and hope that the Secretary will be able from them, and from the abstract of my diary forwarded you with my letter of 18th January last, to obtain some knowledge as regards the best time, and the best modes of cultivating this valuable plant in the Soondurbunds. Letter of 21st August. "I have been sowing small quantities of seed since November last up to

present date, and found at the commencement that the plants sown in the cold weather did not thrive, only a few managed to get through, in March I again planted a good quantity of seed given me by Mr. Cowell, also some country cotton seed, but great drought during this month destroyed the young plants. The seeds sown in May did not do well, but that sown on the high and low lands after some heavy showers in June sprang up, and thrived well, the frequent slight showers we had during that month favored the growth of the plant, insects however which appeared during the night destroyed this, and the ensuing month, a great number of young plants, and I was obliged to re-sow a good quantity of the above lands. The insects are only troublesome while the plant is under 6 inches, after it reaches this height nothing seems to be detrimental to its growth except excessive heat or rain.. The seeds sown in the cold weather took about a fortnight, that in June only 8 to 10 days sometimes less, but the average I should say is 8 to 10 days. The plants on the high lands have managed to stand the rains but not so those on the low lands, which plants at first looked so promising. Whenever we have any heavy continued rain, it is nearly an impossibility to keep the low lands from being inundated, although the sluices are kept constantly opened, the heavy rain beats down the young plants, and by soaking into the lands, prevents the plant from having the strength and vigor it ought to have, and at the same time destroys a good number of the young and tender plants."

Letter of 9th November. "Owing to the heavy rain we had in October which perfectly saturated the low ground I was unable to sow till the 6th of this month. The cotton plants on the high lands I am sorry to say were attacked after the rain by white ants. At first I was unable to find out the cause of plants that lately looked so fresh and promising beginning suddenly to droop, and die. But on

digging about the roots, I found that white ants had commenced regularly undermining and sapping the plants. The natives informed me that it was owing to these lands being fresher, drier, and higher than those surrounding, and told me that they would not attack the plants on the low lands, and recommended me to try a decoction of oil-cake, which they said would kill these destructive insects. I did so, and am happy to say that since then the plants have again begun looking strong, and healthy, and the ants seem to have deserted them."

Letter of 18th January last. "I have deferred sending in my report of cotton, and my opinion regarding the capabilities of the Soondurbund soil for the cultivation of this valuable plant, until I have by repeated trials and failures found that it will not grow on such saline lands as those recently enclosed in lot 42, and I at the same time beg to submit a diary that I have kept regarding its growth &c., from 15th November 1857, up to the present time. I believe that Sea Island, and New Orleans cotton will answer well in the Soondurbunds, but that the soil must be freshened for three or four years, and I still think the best time for sowing it is October up to 15th November, not later. It reaches the height of 18 inches say up to end of December, and then the cold stops its growth. The old plants from December up to 20th January lose their leaves, and about that time new leaves sprout, and plants again commence looking fresh, and healthy. For high lands I would advise sowings to be made about the 18th May, and for low about end of October to 15th November."

4th. Varieties of seed used.—The seed used by me has been Pernambuco, Sychelles or Mauritius, New Orleans, and Sea Island. The two latter have answered best in my experiments.

5th. Ground how prepared.—I first tried preparing the land by means of the English kodalie, this was both ex-

pensive, and slow work, I then purchased a couple of strong young buffaloes, yoked them to the light American plough given me by you, and found that I could plough nearly an acre a day of good ploughing, after which the earth was broken up by means of the harrow and native Moé. This I found answered just as well if not better than the kodalie, the work was done sooner, and much cheaper, and I could plough nearly to any depth necessary, after which I sowed both in ridges and drills; I prefer the latter plan if the lands are high, and not subject to inundations. I am unable to answer the last query, viz. Produce of by weight; as I have not had sufficient quantity of cotton, to be able to give an opinion.

I am, &c.

CALCUTTA: THOMAS HILL.

14*th May*, 1859.

---

S. H. ROBINSON ESQ.,
*Secretary Mutlah Association.*

DEAR SIR,—I must apologise for not answering you note, and queries before this. But my absence from town for the last month has prevented my doing so. The queries you have put me, are rather difficult to be answered, unless experiments are tried on a scale of fifty to 100 beegahs. Raising 100 beegahs would of course be less than the raising of only a small quantity. The calculation for raising one beegah of land three feet high, allowing a foot for sinking would be as follows: 1st: say one beegah or 120 feet $\times$ 120 $=$ 14,400 superficial feet, raising the above land four feet high so as to allow one foot for sinking would contain 57,600 solid feet or as follows:

Trench or drain the same viz. 120 feet length breadth 14 feet depth 6 feet.

Trench 120 feet length 15 feet and depth 6 feet.

One beegah of land with drains on 3 sides contains 14,400 square feet, or raised 4 feet high 57,600 solid feet of earth or 409 chowkas, each chowka measuring 7 feet 6 Inches square by 2 feet 6 Inches in depth @ 4 chowkas for the Rupee. Total cost rupees 102 for raising 1 beegah land 4 feet high, allowing 1 feet for sinking.

Trench or Drain the same viz. 120 feet length breadth 15 feet depth 6 feet.

The above is as near an estimate as I can at present furnish, but if the soil be fresh, even the raising of ground about a foot would answer. From experiments tried by myself in lot 39 belonging to Baboo Degumber Mitter, the lands of which have been cleared, and enclosed for upwards of the last 10 years, I was surprised to find the cotton grow luxuriantly, even on the low land along the banks of the Baskee river. The lands here are raised more than one foot. I may however mention that lands of nearly all grants, are much higher on the sides of rivers, Nullahs, and Khalls, than in the interior. The middle of the grant being almost always the lowest part of a lot. The seed tried by me in lot 39 was some that had been gathered by Mr. Agabeg from his plants. and were consequently very fresh, they sprang up in three or four days. Nearly all hopes of success, depend upon good fresh seed which is very difficult to be obtained in this country. I believe the American planters commence sowing in April, and picking in October. If we could get the seed sent out in November, *of the last crops,* so that it might reach us by the middle of March, we might have greater chances of succeeding. I believe the seed received here is not the

freshest, and on that account our experiments are as often failures. Another plan, I think may be tried, and would I dare say succeed in the Soondurbund grants on fresh soil viz. by making small enclosures of 100 beegahs or 200 beegahs along the banks of the boundary streams, and having small brick gates or sluices to each enclosures so as to drain off the water and keep the lands perfectly dry. As before stated the lands along the banks of the rivers are much higher than the centre of the grant and water therefore could be easier drained off. A rough sketch of the proposal is herewith sent.

I am, &c.,

THOMAS HILL.

CALCUTTA, 20 HILLS LANE:
14*th September,* 1859.

---

*Barripore* 14*th July,* 1860.

MY DEAR MR. BROWN,—I am sorry I have so long omitted to comply with your wishes respecting the letter to Captain Dicey from the Secretary to the Mutlah Association dated April 6th 1859, but the matter quite escaped me. I have now the pleasure to forward the few remarks my very limited experience enables me to offer, regarding the cotton experiment on your lot No. 48. I shall notice the several points on which information is sought, in the order they stand in the letter adverted to.

1st. "Descriptions of locality." The experiment to which these remarks relate was tried on lot 48, on the Mutlah. The soil, on which the seed was sown, in 1856-57, is that usually found on the *Baries,* or small patches of high ground, raised by the salt manufacturies many years ago, and which, by the action of the periodical rains have become in a great measure sweetened.

2nd. "Breadth of surface cultivated." The area of these baries, taken collectively, may be about two bighas.

3rd. "Length of time the ground was cleared and bunded previous to cotton cultivation." Two years.

4th. "Varieties of seed raised." The Sea Island.

5th. "Ground how prepared." The strong reed grass and ulloo were first removed from the surface of the Baries by the hoe. The ground was then turned up, and the roots of the grass carefully picked out. The centre surface of each baree was then dug to about a cubit deep and formed into ridges about a foot high, and four feet apart, after which the soil on the top of the ridges was prepared for the seed, which was sown at intervals of three feet, with the dibble, five or six seeds being put into each hole.

6th. "Produce of cotton by weight." The produce was too small to be weighed. The small sample I sent up was I believe considered equal to the best description of the American cotton, but as I could only collect a few pods at a time, as they became matured, no account was taken of their weight, which must have been very insignificant. I speak only of a few pods gathered from a few plants, here and there, for the seed being put down at different times, the bulk of the plants had not advanced far enough to produce anything during my stay on the grants.

With regard to the culture of cotton I think the Sea Island variety may be introduced generally in the Soonder bunds on the low ground, or that which is commonly appropriated to paddy, provided good arrangements were made for the proper drainage of the fields so occupied. The drainage is necessary not merely to prevent the water from lodging at the roots of the plants, but also to sweeten the soil previously to the introduction of the cotton seed. The cotton field should be enclosed by a compact bund, so as effectually to exclude salt water, and also have a drain on three sides to let off any rain water that may collect within the enclosure.

In its present state the low soil of the Soonderbunds is too stiff and so not suited to the growth of cotton, but this objection would be removed as the soil becomes sweetened, as may be observed in the Barees so common in the Soonderbunds, the earth of which they are composed having been originally taken from the adjoining fields. On these Barees the Sea Island cotton germinates freely, and I am therefore led to think that the same result would follow on the low ground if it were rendered sufficiently sweet. This, as I have before observed, may be effected by the careful exclusion of salt water, and thorough drainage of the field in the rainy season, so as to give the superficial soil a continuous washing with rain. Each heavy fall of rain would, as it was passed off by the drain, take away with it a portion of the saline material of the soil, and at the close of the rains the surface would be comparatively free from salt. The next season would reduce the proportion of salt still more, if it do not wholly remove it from the surface, supposing of course the same attention given to the practice of constantly drawing off the rain water.

Whether the culture of cotton in the Soonderbunds will be remunerative is at present a doubtful question; I do not think it can be made to pay hired labor. If the ryots, resident on the grants, can be induced to take it up on their own account, each man undertaking to set aside a given quantity of his land for the cultivation of cotton, and at the close of the season bringing in the produce, it may yield a profit, but this would again turn on the relative profits of other crops; if these showed a higher return for labour, the ryots of course would not consent to cultivate cotton to their own loss. From what I have said it will follow that the cultivation of cotton can only progress as ryots come to settle on the grants, so that the ground must first be let out to ryots in order that they may eventually be brought to engage in its cultivation. I feel sure

that with hired labour it cannot be remunerative, and from the paucity of hired labour procurable at present, it must also be cultivated on a limited scale, which I imagine would not serve the object contemplated by the Mutlah Association. I am not aware that any experiment has been tried with cotton on Soonderbund lands that have been already under cultivation for many years past; such land is to be found on the banks of the Piallee river on the Bydyadurrie and elsewhere: an experiment in such localities would at once remove the doubt, as to whether the Soonderbunds can be made use of for the culture of cotton.

I return herewith Mr. Robinson's latter to Captain Dicey.

(Signed,) A. H. MOORE.

---

*Note on the Palm—Sagus Rŭffia—,"Morfia" of Madagascar and Bourbon. By* CAPT. W. H. LOWTHER.

This beautiful tree, of which I sent you a large package containing a portion of the mature nuts, per *Perigny*, supplies the principal wants of life viz. food, clothing, and shelter to the immense population of Madagascar. Its leaves supply thatch,—its fibre, bandage, sails, and wearing apparel;—its wood, planks, and rafters;—its pith and nuts, subsistence.

At Bourbon this fine Palm seems perfectly naturalized, but in the general mania for sugar cultivation is neglected, and uncared for.

The venerable Supt. of the Imperial Gardens, Monsr. Richard, informs me that he supplied Dr. Wallich many years ago with its nuts, but cannot tell me whether they succeeded.

A small quantity of the cloths find their way out here in the small trading vessels: the finer kinds are much used in the shape of summer clothing by the colonists of Bour-

bon, while the coarser are even in greater demand for sun screens, sails and packing.

The price of the former is in Bourbon 5 francs (just 2 Rs.) per piece,—of the latter one franc. At Tamatanc, the principal trading port of Madagascar, any quantity may be procured, and doubtless at a far lower rate: colours and patterns are to be found in great variety.

This material washes well and the colours are quite fast.

I find the coats and waistcoats as light and cool as grass-cloth, but more harsh to the touch: no doubt our Indian weavers could turn out something very superior from this material. I am told that late experiments in France proved that these nuts give an excellent oil.

MAURITIUS:
*November*, 1860.

---

## *On the cultivation and preparation of Tobacco as practised in Rungpore: By* J. H. GOULDHAWKE, ESQ.

India presents so extensive a field for enterprise in its mineral resources; its various soils and climates are well suited to so many kinds of vegetable productions, that it is strange indeed she has not supplied the world with more articles of commerce. The object of this paper, however, is not to investigate the shackles that restrain enterprise, but to point out one of the many resources that India contains. Our tea plantations may make us eventually independent of China. We might supply the looms of England with cotton, and I feel convinced beer need not be imported if we would but grow *hops* in the hills: nor need we trouble any foreign market for Havannah, Manilla or any other kind of tobacco, did we but turn our attention to the growth and preparation of this luxury. At present the best Indian tobacco is grown in Rungpore. I hope my description may induce better cultivation in other districts,

and lead others to experiment with imported seed till we obtain a cigar that may rival those now in use.

When a ryut has a choice of soil he selects a rather sandy loom for his tobacco field round which he digs a deep ditch for the double purpose of protecting it from trespass, and also, by levelling down the earth thrown on the field, to make the edges somewhat higher than the centre. The new soil too thrown up contains the vegetable manure of leaves and grass that have rotted in the trench: the sides of the field being high in a great measure prevent the rains washing out the manure.

We will suppose the period to be August. In some convenient part of the field may be seen a large heap of cowdung that rises above the sides of the pit dug for its accumulation. It is partly hid from sight by dead branches on which some trailing vegetables shew that the best use is made of the manure even while it is accumulating. By the end of September these plants have given their produce; the rains are breaking up and the ryut pulls up stalks of Indigo half dead from the slight ploughings, during the close of the rains, allowing water to lodge in the furrows. As the weather clears up, the ryut continues preparing the land, his wife and children scattering the manure in small baskets all over the field. About the first of September the tobacco seed has been sown on a plot of a few yards square, raised about six inches high and well prepared. The third or fourth day after sowing, should it not rain, the plot is watered, and continues to be watered occasionally till the plant has four to six leaves. The seed, being sown by handsfull, comes up very thick, and all weeds are carefully picked out with the hand.

About the 1st October, the field, by continual ploughing, smoothing down and burning of jungle, is prepared like a garden; and being sandy, not a clod is to be seen any where. Even the edges of the field, which the plough

could not reach, have been prepared with the *kodall.* The sides of the ditch, newly smoothed, shew no weeds, a blade of grass cannot be found in the field. By this time the plants on the plot have leaves four inches long and consequently large enough for transplanting.

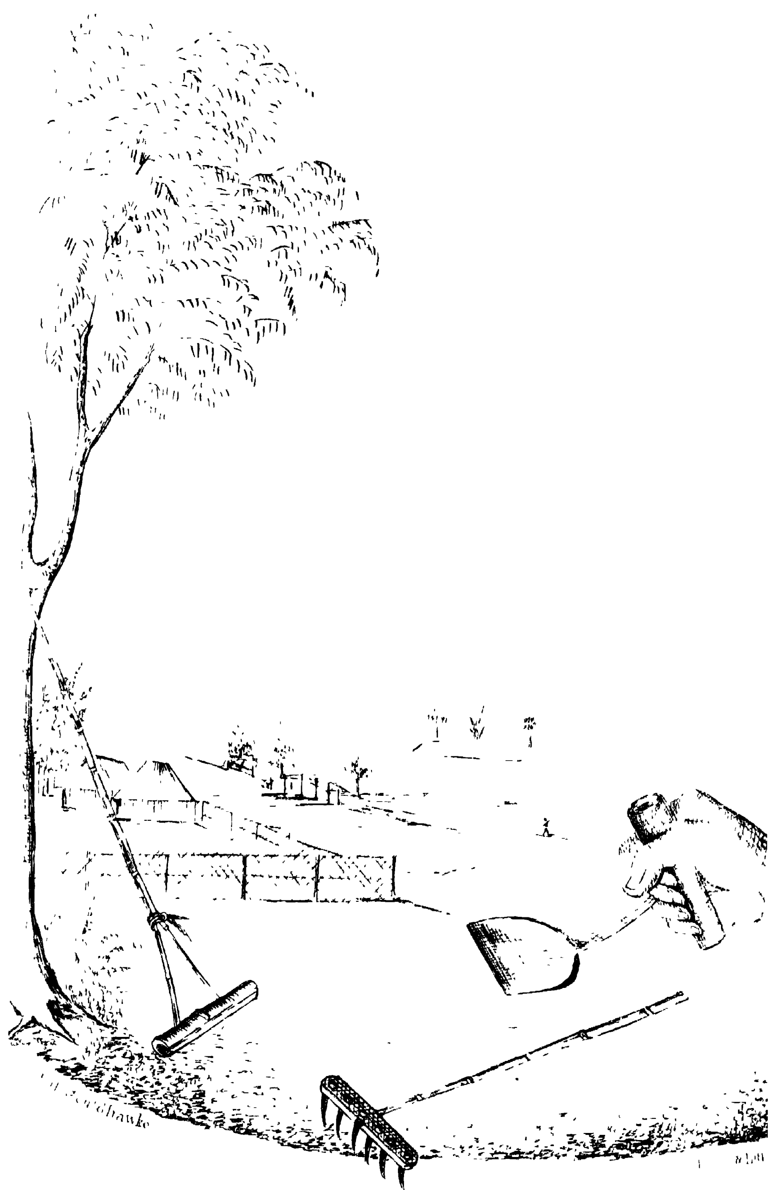
For this operation the afternoon is preferred. We will suppose the field to be perfectly square and corresponding with the cardinal points. Two men proceed to mark off the field into small squares which is done in this way. They take two cords long enough to reach across the field: each of the men have two pegs, and a wand cut exactly one and a quarter cubits, to measure distance: so provided they take up their positions, say on the eastern edge of the field, one at the north corner, the other at the south; then measuring from the edge of the field with their wands, they peg down one cord, then with another measurement, the other cord, shaking the cords to get them to lie perfectly straight and parallel to each other. One man, now, with his wand in his hand, walks to the opposite side, *dragging one foot so as to leave a trail along side of one of the cords.* The other man does the same guided by the other cord. Having thus changed positions, they take up the cords, and measuring with their wands, again peg them down for fresh trails. This is continued, the men passing and repassing each other, till the whole field is marked by trails in parallel lines from North to South and at equal distances ($1\frac{1}{4}$ cubits) from each other. The cords are now made to *cross* the trails and the whole field is marked off in squares like a chess board.

The largest plants on the nursery plot are meanwhile pulled up. While some bring them in baskets, and walking over the field, drop a plant at each *crossing* of the trails, others proceed to plant them at the *exact point of intersection.* The lines of plants are consequently parallel, seen from any side of the field. A few plants are pur-

posely put down, here and there, in clumps of four or five together. These are intended to supply the place of such as may not take root. Considering how roughly the plants are pulled up without any earth to their roots, and that they are not watered after being planted, it is surprising more do not die. The reason assigned for not watering, is, that it generates a worm like a caterpillar, but even without watering this insect is found to cut many plants. It must be looked for at the root, just under the surface soil.

By the time the plants have grown to double the size that they were first put down, the field requires weeding: the blanks left by those that have died are now filled up with the spare plants (in clumps) above mentioned. These are now carefully taken up with a portion of earth. Here I would remark that the Rungpore *nireenee,* or weeding instrument, is the most efficient one I have ever met with. The blade is two and a half inches broad, with four cuts a small square piece of earth is raised with a plant. I give a sketch of this instrument as well as of others afterwards described. The handle is a piece of wood about four inches long and thin enough to be firmly grasped like the hold one would take of a dagger; the blade, two and a half inches square, ends off into a rod of six inches which passes through the centre of the handle at right angles like the letter T. When the handle is grasped the rod is between the knuckles. The handle is a kind of lever and allows of the earth being turned up to a good depth, while the handle of the common *nireenee* or *pusnee* hurts the *palm* of the hand.

I now come to the reason why the tobacco is planted so exactly in parallel lines. It is to allow of the use of two instruments employed for keeping down weeds and stirring the surface soil. One is a wooden rake, and, for want of a name, I call the other *the smoother.* The rake requires no further description than that the bar, in which the bamboo teeth are fixed, is one cubit, to allow the rake being



SMOOTHER RAKE AND NIREENEE

drawn between the rows of tobacco plants without touching them. The teeth are about two inches apart and two a half inches long. This rake is made heavy enough to penetrate the soil an inch deep while it is dragged along, and if it does not do so, a log is tied on it. After the first weeding has been given, on the least appearance of weeds again coming up, dampness or caking of the surface, the rake is drawn up and down between the rows of tobacco and then crosswise; giving the field the appearance of diminutive furrows. It is left in this state for a day or two for the weeds to wither or soil to dry, when the smoother is run up and down between the rows of tobacco and then crosswise, rubbing into the dust the half dried weeds and rooting up those that the rake had left still holding by some fibres. The smoother is made by taking *a cubit* of the *solid thick* kind of bamboo, split it in half and you have the bars for two smoothers. A handle is made of the thin end of a bamboo about six feet long: its thicker end is split to insert into two holes made in the bar. When the labourer holds the handle of the smoother, the natural round surface of the bamboo bar is towards him: so that in *pushing* the instrument along before him between the rows of tobacco, the *sharp* edge of the bar catches the weeds and loose soil. Practice teaches the angle at which the smoother is to be pushed, say about 45 degrees or less. As heaps of weeds or loose lumps collect, the labourer skips over them. After the whole field has been smoothed down lengthways and crosswise, the ryot takes his basket and weeder, picks out the weeds which he throws into his basket, breaks the lumps, and scatters the earth. From continual practice the raking and smoothing is done at a running pace: and one man with these instruments will keep the surface of four biggahs of tobacco light and free from weed, till the size of the leaves prevents the use of rake or smoother. The leaves of the tobacco then keep down jungle.

Extra hands are required to loosen the soil round the roots of the plants, this is done with the *nireenee* or weeder before described.

After eight or ten large leaves are formed it is necessary to destroy side shoots and check the growth of the centre shoot. For this purpose a piece of hard bamboo is used much resembling a knitting needle, except that one end is flat and about the sixteeneth of an inch broad, this end is made sharp and hardened over fire; it is inserted at the point of the centre shoot and run down into the stem to within three or four inches of the root. The effect is to stop the further growth of the centre shoot, the stem becomes clubbed and all the nourishment goes to the eight or ten leaves which are suffered to remain. Little side shoots, as they appear, are cut off with the edge of the probe.

As a rule no water is ever given to the plants, and only in one or two instances have I seen an attempt made to water the leaves of large plants: then a large bamboo syringe was used having many holes at the end, answering somewhat the purpose of the watering pot rose. An earthen gumlah was carried about, the syringe sending the water in mimic showers over the plants.

As the leaves arrive at maturity, known by their turning yellow, they are cut off by means of a hooked pruning knife. One man going from plant to plant, severs the mature leaves *only* which fall to the ground. Other men follow to pick them up and throw them into large light bamboo baskets held on the left hip. The leaves, removed from the field, are heaped up on some convenient spot, such as a threshing floor. The labourers now sit round the heap, each provided with a small bundle of *green* split bamboo, about a foot long, so finely split that it resembles stiff tape. Four or five leaves are laid one over the other, and the stalks are bound together with a piece of split bamboo;

these bundles are called hands. No knot is tied, but the ends are quickly twisted together and tucked in.

To prevent confusion, every one throws what he ties behind his back and so out of the way.

According to the extent of cultivation the ryut has a good number of drying poles ready each *ten* feet long made of the light thin kind of bamboo. Some four or five bamboo posts five feet high are now put down in a line north and south, their upper ends cut forked to support a thin bamboo which is lashed on. At a distance of *nine* feet from these posts and parallel to them, another similar line of posts is put down with a bamboo lashed on their tops.

This is a rude scaffolding to support the ends of the drying poles. One of these poles is now taken to the heap of tobacco. The ends of the pole being held by two men, others arrange the hands of tobacco on it astride, as it were, and as close together as possible. Each pole, so covered with hands of tobacco, is placed on the scoffolding just described. Some ryuts have as many as 200 drying poles, which remain on the scoffolding day and night till perfectly dry.

As the stalks dry, the ties become loose: the ryut chooses a day when an easterly wind is blowing to take down the tobacco and lighten the lashings: this is repeated two or three times as required. The east wind renders the leaf soft and pliable and consequently there is little broken: during a west wind, the dry leaf is exceedingly brittle, and any handling would not leave a leaf whole. It is not to be supposed that the tobacco is intended to remain suspended in the open air in all weathers. Rain would quite spoil it. An empty cowshed or some such thatched house is prepared beforehand to house the tobacco in. Loops of twine have been tied to the rafters of the roof at such distances as to support the ends of the drying poles. At the first signs of a storm coming on, without a moment's delay, one by one the drying poles are brought in covered with hands

of tobacco and handed to two men who, hanging from the roof, slip the ends of the drying poles into the loops, commencing from the lowest range on the sides, and when all the tobacco is housed, the roof presents the appearance of a mass of tobacco leaves, with their points hanging downwards, as if the thatching consisted of them. It is also in this fashion that the tobacco is kept housed after it is perfectly dried, during the whole of the hot weather. Damp weather in May is taken advantage of to bring down the tobacco. As the hands of tobacco are not tied to the poles, they readily glide off into a heap, the poles are put by carefully for next year's use, and all the labourers sit round the heap to adjust the leaves. A little deception is now practised, which might well be dispensed with; it consists of hiding inferior leaves between good ones. Straw is now scattered in a corner on a *machan* or scaffolding. The hands are now placed so as to form a circle, the stalks outwards and the leaves spread flat. The different qualities are made into different heaps, generally two. The tobacco is now fit for sale.

It will be remembered that the leaves only are cut as they get ripe. Such is not the case in other districts where the whole plant is cut and removed while half the leaves remain yet green. While in other parts the ryuts split the stalk and dry it with the leaves, the Rungpore ryut leaves it standing in the field, drying only *mature* leaves.

Under the most favorable circumstances of soil, weather, and cultivation, the leaves grow very large and thick, having a glutinous substance on their surface. This substance I suppose to be narcotine in a crude state as the ryuts affirm such leaves give the strongest tobacco.

Should the ryut not possess a plot of ground sufficiently sandy and light, he is obliged to keep the soil raked up to allow of evaporation: in some instances a light hoeing is given with worn out kodalls. The crop on damp clay soils is always backward and gives small inferior leaves The only improve-

ment I have been able to add to the Rungpore mode of cultivation is the use of the Dutch hoe besides the rake and smoother.

Tobacco occupies the land from August to February consequently indigo is the best crop to succeed it. The latter may be grown under advances from planters, or what is oftener the case, it is sold to the higest bidder, as it stands on the ground at a very variable valuation, according to the produce it is likely to yield.

The great care taken in the cultivation of tobacco in Rungpore induced me to try Manilla and other varieties. My supply of seed from the Society came to hand too late for that season. I, however raised seed for the next year, which a foolish *Mallee* mixed in beating out; and strange to say, only *one* kind came up, resembling that common to the district in having large leaves; but these were of a much lighter color and very thin. I had cigers made up by Chinsurah workmen; a Calcutta sircar having had the supervision, the greater number were badly made, but the flavor of the tobacco was good and required only keeping to mellow.

I omitted to say that the refuse of indigo plants is *the best manure for tobacco.* It is eagerly sought by the ryuts. They buy it from the vats, remove it immediately to their fields, and heap it up in a large deep hole like other manure. I would suggest to planters to introduce the cultivation of tobacco as it alternates well with indigo, gives the ryut a good return, and renders the cultivation of indigo more easy.

---

*Report on the kinds of crops that might be advantageously cultivated on the right bank of the Damooda in reference to the recently changed state of the country: By* GEO. E. EVANS, ESQUIRE, *Agricultural Chemist.*

*To the* SECRETARY TO THE AGRI.-HORTICULTURAL SOCIETY, CALCUTTA.

SIR,—I take the liberty of bringing before the Council of the Agri-Horticultural Society, the condition of the

country on the right bank of the Damooda, in the hope of receiving suggestions calculated to remedy the evils now extensively experienced.

2. The Council are aware that the public embankments which had always been kept up to prevent the country on both sides of the river from being overflowed by the torrents which descend from the hills during the rains, have been given up for the last few years, and that the private embankments have in consequence proved wholly insufficient to prevent the inundation of the lands and the destruction of villages, crops, and cattle. Since then an embankment altogether proof against the encroachment of the river, has been erected on the left bank for the protection of the railway. The consequences of this measure are obvious. The water, which formerly overspread both banks, meeting with an effectual resistance on the left bank, now strikes with double force on the right bank, and spreads devastation over the whole country on that side. Nor is the effect confined to the commencement of the season, or the first heavy falls of rain. The inundation is felt with equal violence every few days, and from the incessant action of the element the failure of the crops is all but certain.

3 The inundations, however, bring down earth from the hills, which is deposited upon the fields over which they pass, to an extent varying according to the distance of the fields from the river. The deposit is highly fertilising, and where, as on the fields immediately near the river, it is to a considerable extent, the cultivation is proportionally profitable. The fields which lie further from the river, and being paddy land and much lower than those that lie nearer, not only receive a small accession of soil from the inundations, but are exposed to the whole fury and violence of the outbreak.

4. The Rev. Mr. Long, who has observed the changes which have been going on, and noticed the quality of the

deposit, is disposed to believe that, by substituting some other system of cultivation, these lands which are now altogether ruinous to the Ryots, may be rendered profitable. As he has kindly undertaken to communicate all the information he has acquired by his observations, I am induced to request that the Council will be so good as to take the subject into consideration, with a view to the benefit of the people of that part of the country, who amidst prospects so discouraging, can with difficulty be prevented from abandoning their paternal homes and fields.

I am, &c.

CALCUTTA : RAMAPERSAUD ROY.

16*th March* 1860,

*To* A. H. BLECHYNDEN ESQ.

*Secy. Agricultural and Horticultural Society of India.*

*Calcutta* 8*th January* 1860,

SIR,—I have the honor to submit my report of the inspection of the yearly inundated tract of country West of the Damoodah river, belonging to Baboo Ramapersaud Roy.

I commenced the examination on the East side of the river, although the country there is not now subject to inundation, for the purpose of gaining all the collateral information possible upon the question at issue.

I found that the soil has been materially improved, owing to the river having some years ago carried down a large amount of finely divided clay and siliceous matter and holding in solution a considerable quantity of saline substances, which from the rapid evaporation of water off such a large space, have become deposited and left the ground comparatively rich in those ingredients.

When I passed over the ground most of the *paddy* had been cut and removed, and I was informed that the crops

had all turned out favorably. I saw some very fine crops of tobacco, potatoes in patches, mustard and several kinds of vetches; also the mulberry for silk cultivation on high ground; and only lamented that a much greater breadth of land was not being cultivated for the growth of the *Rubbee* crops generally.

After crossing the Domoodah to the west side, I examined the soil more narrowly and selected from different places three samples which I considered characteristic specimens, these I brought with me for chemical investigation, and have submitted them to a qualitative analysis. I am at present conducting a quantitative determination of their constituents and will be able when the analyses are complete to give you further information as to their respective value, at present I give as my opinion that the soil does not contain any matters deleterious to the growth of plants.

I consider that the problem, as to the practicability of bringing these lands again under fertile cultivation, must be treated more as an engineering than an agricultural question.

The removal of the embankment from the west side of the river having become imperatively necessary, and although several thousands of beegahs of land have been unavoidably rendered unproductive, whole villages swept away and hundreds of poor unfortunate people deprived of their means of subsistence and driven from the homes of their forefathers, still, the embankments ought never to be reconstructed in their original form, but I should like to offer a suggestion which occurred to me on the spot.

As is always the case with running water carrying matters in solution, mechanically, I found that where the rush of water was obstructed in its course, that there a deposit of very fertilizing mud called by the natives *Pullai Muttee* was spread over the surface, and after instituting a searching examination of the localities thus indicated, and from

the information gleaned from the occupiers of these lands, I arrived at the conclusion that if a series of semicircular bunds were constructed in *Echelon* along the south side of the river, with their convex surface presented to the current, opposite to where the old bunds have been cut away, and a system of such embankments extended, a large deposit of most valuable mud would subside from the numerous eddies formed by the rushing of the water round the ends of the embankments into the concavities; and ultimately cover the immense tract of country, now subject to annual inundation, with a layer of rich alluvium; and the volume of water which like an avalanche rushes impetuously over the country carrying spoliation and misery in its course, would, its force having previously been diminished by coming in contact wich each successive embankment, diffuse itself gradually and gently over the surface.

A small diagram will explain my meaning more fully, where A represents the river, its course marked by arrows—*B* represents the embankments in *echelon*, and *C* that of the system extended.

The embankments marked *B* might be made about 3 miles long each, measuring from the river, and they having to bear the first rush of water would of course require to be constructed in the most substantial manner, the cost and height of erection diminishing in proportion to the distance from the river's bank.

A large number of now useless embankments exist which might be economically adapted to the system which I recommend.

The object being not to confine the river to its course, but to lessen the force of the inundation, the embankments I propose do not require to be constructed of a similar strength as the former banks, as the water finding its way all round the embankments and pressing equally upon all their sides the necessity of constructing them, so as to

render them capable of resisting the enormous pressure upon one side only, is altogether obviated.

In passing over various parts of the country, I found the soil excellent and upon my urging upon the ryots the advantage of cultivating more *Rubbee* crops, I was pained to hear the natives complain, in piteous terms, of a great want of water for irrigation purposes, and I feel convinced that those now unproductive tracts would become most valuable sources of revenue, if a thorough system of irrigation were carried out. I think that a vast quantity of water for irrigation and other purposes might be obtained during the rains and stored up for future use, by taking advantage of the numerous useless tanks which are dotted over that part of the country, and which at present are prolific sources of disease in the shape of malarious vapors arising from their surfaces. There are also various blind Nuddies which if dammed across at intervals would become capacious reservoirs for water, which is now allowed to pass heedlessly over the ground, and whose want is so much felt during the dry season.

I must now advert to the great dislike evinced by the natives, amounting to a prejudice, to cultivate any other crops than those which they have been accustomed to, and this remark applies to other localities in Bengal which I have previously visited.

I consider that a splendid opportunity now presents itself for the introduction of farming upon good scientific principles, and now, when the Ryots occupying the lands in question are at a loss to produce from the soil sufficient for their support, were the large landed proprietors to unite and establish a system of Agriculture based upon English experience, they would be conferring upon their tenants incalculable blessings, and at the same time enriching themselves by converting immense tracts now utterly useless into most fertile sources for the production and luxuriant growth of the necessaries of life.

I cannot conclude this report without bearing testimony to the valuable assistance I received from Mr. Long, who accompained me, and to whose thorough knowledge and appreciation of the native character and language, I am indebted for the elicitation of much of the information I obtained.

I have &c.

GEO. E. EVANS.

*Agricultural Chemist.*

---

SIR,—I have much pleasure in sending you the result of my analyses of the three samples of soil which I brought with me after examining a large portion of the ground yearly subject to inundation.

100 parts of each contained respectively :—

| | No. I. | No. II. | No. III. |
|---|---|---|---|
| Water, .. .. .. | 10·89 | 3·40 | 4·44 |
| Organic matter, .. .. | 2·37 | 5·75 | 3·13 |
| Sand & Siliceous matters, | 86·22 | 76·10 | 84·41 |
| Peroxide of iron, .. | 0·04 | 2·84 | 3·05 |
| Alumina, .. .. .. | —— | 1·63 | 0·86 |
| Carbonate of lime, .. | 1·02 | 5·00 | 3·24 |
| „ Magnesia, .. | 0·02 | 0·75 | 0·03 |
| Alkalies, .. .. .. | 0·01 | 2·22 | 0·69 |
| Sulphuric acid, .. .. | trace | 0·94 | 0·14 |
| Phosphoric acid, .. | —— | 0·06 | —— |
| Chlorine, .. .. .. | 0·01 | 1·10 | 0·06 |
| Loss, .. .. .. | —— | 0·21 | —— |
| Total, .. | 100·58 | 100·00 | 100·05 |

No. I. Was taken from a large tract of country covered with nothing but long rank grass and intersected in all directions with nullahs and jheels caused by the inundations. I obtained the sample from close to the village of Daspoor

nearly halfway between the Damoodah and Baboo Ramapershad Roy's residence. It will at once be perceived that it is the most infertile of the three owing to the absence of some of the more important substances and the very small proportion of others. To bring this extensive tract into profitable cultivation, it will be necessary to institute a thorough system of drainage, irrigation and manuring.

No. II. Was taken from Kaiba and is a very fertile soil indeed, and is capable of producing all the known crops. To cultivate the rubbec crops on it as well as the others an efficient system of irrigation is necessary, as *nothing is wanting in the soil* necessary for the healthy growth and nourishment of the plants that may be grown upon it.

No. III. Was also taken from near Kaiba, but is not so good as No. II. but still a good fertile soil and capable of producing any of the known crops.

As I suggested in my former letter to you, that the numerous broken down tanks and old water courses might be rendered, with a little repair, useful as reservoirs for water, and thus supply the great want now felt by the cultivators. Numerous crops such as vegetables, opium, cotton, flax, tobacco, oil yielding plants, oats, barley and all kinds of grain, might be grown successfully on any of the soils I have examined, if the ground could be irrigated with an abundant supply of water, during the time it might be occupied with any of the above named crops.

GEO. E. EVANS, A. B.
*Agricultural Chemist.*

CALCUTTA :
*27th February,* 1861.

*Notice on the culture of the Vanilla plant; the fecundation of the flowers; and the preparation of the Vanilla bean: By* M. David de Floris, *Inhabitant of the Champ Borne, Quarter Saint Andre, Ile de la Reunion.*

*(Translated from a pamphlet in French received from Capt. W. H. Lowther.)*

*Vanilla Culture.*

The Vanilla creeper, flourishes in hot and moist regions. There are two kinds in the island of Bourbon, easily distinguishable. The little Vanilla generally spread abroad, originally from Mexico, of the best quality, and the big Vanilla with large, broad, and thick leaves, of inferior quality, and of which the pods fall before having attained maturity.

The Vanilla is planted in cuttings at the foot of the trees which are to serve it for a protection, or along sheltered walls and palisades.

The cutting must have at least three knots; it may also have 4 or 5 knots, or even more, according to the disposition of the protecting trees or the shade which they can give.

A plantation of 2004 cuttings, which I made last year in the month of May with creepers of from 10 to 12 feet long, gave fruit in the same year and is now in full bearing. But I must confess that these creepers had already their buds which immediately continued to shoot.

All trees are good as protectors with the exception of those which change their bark, the best are the mango tree, the Blackwood, [*Acacia Lebbeck,*] the Dragon tree, [either *Dracaena Draco,* or *Pterocarpus Draco,* probably the latter,] the Jack tree, the Ouatier, [*Bombax Malabaricum?*] the Pignon d' Inde [*Jatropha Curcas*] &c. But among these the Pignon d' Inde cannot be planted alone, on account of its shedding leaves when the Vanilla trees are in bearing, the sun then striking upon the Vanillas and upon their pods, is very injurious both to the one and to the other. It is

necessary therefore to plant the Pignon d' Inde between the Dragon tree and the Ouatier, or other trees the leaves of which may serve to shade it as well as the Vanilla plant, to which it only serves for a protection during a certain period of the year.

The protecting trees ought to be planted at 5 feet by 4 from east to west, or at 6 feet by 5, according to the greater or less land possessed. They may even be planted at 6 feet by 6 which would give more air to the plantation.

The system of 5 by 4 which I have adopted in my new plantations of Dragon trees is the one to which I give the preference; it then becomes essential to make the creepers climb from tree to tree, still from east to west, to avoid their too great agglomeration on the same prop, and to plant a strong stake between the trees, so as to well steady the creepers and to avoid the shocks which the wind or the fall of branches on the interlaced creepers might cause; this fall of branches can be avoided if care is taken to prune the trees frequently.

For the Vanilla plantations, already formed, and where the props are at greater distances, one must take down the creepers when they have attained too great a height and roll them up or train them within reach on the natural branches; or else by putting strong arms to the trees which have not got them, so as to keep the creepers always within reach, to facilitate their fecundation. It happens however that some branches are too high which necessitates the use of ladders.

In Bourbon, March, April, and May are the rainy season.

The months recognized as the best for planting are March April, and May. One may, however, do so in the months of September, October, November and December: being careful to water the plants if it is very dry at that period.

The supporting trees should give enough shade before receiving the Vanilla plants. In case however one should require to plant before the necessary shade exists, the plants

must be surrounded with palm leaves in preference and watered much more often than if they had their natural shade; the Vanilla plants should be put in the ground at the side of the supporting tree opposed to the sun so as to escape the heat of the sun.

The longer the cutting the more knots must be put into the ground.

One knot when the cutting has three, two when it has four, and four or 5 knots when you plant long creepers.

These cuttings should be planted laid in the ground, the claws towards the tree well fixed with one, two or several flat ties according to their length.

They must not be tied with round string which would finish by strangling the plants, the leaf of the Vacoa [*Pandanus Vacoa*] is the best tie.

If the soil is dry or poor it is well and even indispensable to use mould for making the plantation; manure would be hurtful.

Young plants with roots on the other hand may be planted in dung, provided always that it is well rotten.

Vegetable manure, less heating, composed of leaves of blackwood or of any other strong rich leaves is also very good and even preferable, but it must also be well rotten, the roots of the Vanilla plant and particularly the new ones being very tender and delicate.

Watering in the first days after planting is always an absolute necessity particularly in a dry locality.

Plants put in the ground in the middle of winter languish, lose their buds, and often perish.

The earth is trodden down on each plant after having been watered, to avoid the action of the air, always very injurious.

If the Vanilla plantation is made near the seashore it is necessary to shelter it from the salt air which would burn the plant and would render it poor and sickly.

The pruning of the protecting trees is so done as to preserve a half shade(*Demijour*) so as to have as much sun as shade and even a little more sun.

The pods too much shaded are long, soft, thin and difficult to ripen, whereas on the contrary when they are sufficiently exposed to the sun they are fat, round, firm and contain much more flavor.

On sloping ground a west slope is preferable, so that the Vanilla plant may not be exposed to the wind, and that it may receive more warmth.

It is indispensable that each of the trees which serve for a prop should be surrounded with rocks to keep in the manure which is then covered with smaller flat rocks to avoid the evaporation of the manure, to keep the roots cool, prevent the rains washing the earth from the roots, and the animals from digging up the ground.

The manure placed under the rocks is renewed once a year a little before the flowering season.

The cuttings may be put out in a nursery, in a space well dry and rather shady, at the distance of 5 or 6 inches from each other and alongside of supporting props on which the new shoot climbs actively.

*Fecundation of the flowers.*

In the flower of the Vanilla the male organ is separated from the female organ by a light skin which prevents the natural fecundation. It is necessary therefore, after the flower is completely opened, to remove this skin with a little instrument, and by a light pressure of the thumb and of the forefinger to cause communication between the two organs.

Fecundation is made from 8 or 9 o'clock in the morning till 3 o'clock in the afternoon, and may even be counted till 4 or 5, but the pods fecundated late never acquire the length and the size of those fecundated at the proper moment.

The instrument used for this operation is generally 3 or 4 inches long and made thin and round at one of the ends. It must not be either sharp or triangular in which case it would wound the organs of the flower or cause the pollen (a colored powder in the anther) to fall, or might cut the male organ. *Les Cotons* [spathe or protecting leaves surrounding the flower?] or *nics* (according to the term we use) of the Palm tree, the Plane tree or the Cocoa tree, are the best instruments for the fecundation. After having been used, for the purpose of finding them again each morning, they are stuck into the leaves of the Vanilla.

Light ladders are used to climb up and fecundate the flowers which are out of reach.

The organs of the flower must never be pressed with force and this operation should always be done with much care by skilled fingers.

The flowers of the Vanilla begin to appear from June and are fecundated up to September. [In India from February to April.]

In high and colder regions the flowers appear and the pods ripen more slowly.

The first flowers should be fecundated in preference and the others removed after the 5 or 6 pods which ought to be kept are ascertained to have well taken.

Five or six pods on each bunch are generally left when the Vanilla plant is well covered with flowers, if one wishes to obtain fine fruit. But it sometimes happens that a fine creeper only bears a few bunches; in this case one may fecundate eight or 10 flowers or even 12 in each bunch, the tree then necessarily being able to nourish more fruit.

### *Harvest.*

The Vanilla is gathered when the pods have attained to ripeness. One knows that the pod is ripe when the

end begins to turn yellow and also by a yellowish tint, a true sign which shows the time for gathering the pods.

The pods gathered too green dry with difficulty, are liable to be mouldy, and sometimes become rotten, when the weather is very damp; there are some even, the most green, which become white and are then fit for nothing.

It is necessary therefore to superintend the gathering, and to have it done by intelligent persons.

The gathering takes place every two or three days to prevent the pods which are too ripe from splitting. It happens sometimes however, in spite of this precaution, that some split pods are occasionally found, either from having been forgotten or from being hid under the leaves; these pods which would remain unperceived betray themselves by the delicate odour which they exhale.

The split pods are generally the finest and the best but to solder them (reunite the two valves) it is necessary to perform a minute operation: the split pod part is steeped in hot water and surrounded with little bands of cloth drawn rather tight.

Thus prepared these pods are hung in the air by means of the little bands which are used to tie them up, and thus become perfectly dry.

One can also after the split part is soldered pass the upperpart, which seldom splits, through hot water to hasten the drying.

The little bands are tightened two or three times according as the pods diminish in thickness in drying.

Although superior in perfume, from the fact that they have attained their last degree of ripeness, these soldered pods, which have become round by the pressure of the little bands of cloth, are not much appreciated by the trade, which is but seldom in the habit of seeing such.

The little bands of cloth are dried out flat and serve for several years.

To gather the pod entire it should be held by the but end, and it is detached from the bunch by pushing it to one side with some force.

Some persons take the pod by the middle, or by the end and draw it towards them, but when so treated the Vanilla often breaks and the entire bunch is detached from the tree with pods still green.

Other persons also gather the Vanilla by pinching it off with the nails, but then the but end no longer existing prevents uniformity in the packets and raises difficulties for the sale.

At the end of the harvest the last pods ripening together the entire bunch should be gathered.

*Preparation of the Pods.*

At each gathering, after the pods have been detached from the bunches and put in a basket, this basket is plunged from 18 to 20 seconds in a caldron of water, hot *but not boiling*. The little beans should be scalded separately but only for 15 seconds. To ascertain if the water has reached the proper degree of heat, one should be able to bear one's finger in it, feeling the heat strongly, or to seize the moment when the water throws off a thick smoke and begins to make a certain noise which happens shortly before the water attains boiling point.

Then taking the pods from the basket they should immediately be spread on dry grass, on mats, or on gunny, to be drained.

About a quarter of an hour after this operation they are exposed to the sun for from 6 to 8 days or sometimes longer, according to the weather, on tables previously covered with woollen coverings, until the pods become brown and withered.

Every evening they are gathered into chests equally lined with woollen cloth in which they are allowed to stew.

When they have become withered and brown after the proper exposure to the sun, they are put in the shade, in an airy locality, on little tables again covered with woollen cloth, so as to hasten their drying, to prevent their getting mouldy, above all to induce then to preserve, although dry, the pliability required by the trade.

These pods remain upon little tables until they are dry.

While they are still exposed to the sun, at 2 or 3 o'clock in the afternoon while they are still hot, it is necessary to press the pods with some degree of force between the fingers to flatten them a little, and to spread equally and regularly through the pod the essential oil and the seed, which are in greater abundance in the lower end, to render it supple and shining, and in short more fit for the trade which requires it to be thus prepared. This operation is performed some days after their exposure to the sun when they have become sufficiently faded, but always before they are put to dry.

One ascertains easily that the pods are dry when they have become black, or rather of a chocolate color, and when there does not remain any moisture, particularly on the but end, the part which always dries last.

The dry pods are chosen and put into boxes of tin where they attain their last degree of perfect dryness and pliability.

This is done every two or three days, and sometimes becomes necessary every day, according to the number of men employed and above all at the end of the harvest.

The pods are then put up in packets, and for the pods in each packet to be of the same length it is necessary to work with a large quantity of dry pods.

The packets are composed of 50 pods tied round the middle, and also by preference a little lower towards the end of the pods, which without this precaution, might open at the ends.

For tying the packets it is best to use the string of the *Rabane*, a dry, supple and strong string.

*Packing.*

The packing is done in tin boxes made according to the length of the pods and length of the packets to be enclosed. Each box contains sixty packets or six rows of ten packets one above the other.

This package similar to that of Mexico is required by the trade.

The tin boxes are covered with a label showing the number of packets, the length of the pods, their net weight, and the tare of the boxes.

They are then (if it is intended to send them to France,) enclosed in a wooden case just of a size to hold them, and to preserve these tin boxes from rust, it is advisable and even necessary to surround them with saw dust.

*Hoar Frost.*

The Hoar Frost (white and shining crystals or Benzoic acid) forms upon the pods when they are shut into well closed vessels after they have been packed up for three or four months.

Several traders require frosted Vanilla in preference, others do not seem to care about it; others again require, when the Vanilla has just arrived in France, the means of frosting it before exposing it to sale.

It does not belong to us I think to judge this question, of itself sufficiently delicate, nor to prevent the hoar frost from forming naturally upon the pods, and still less to use any means which would necessarily injure the beauty or the perfume of the pods.

For a person making a sufficiently large quantity of Vanilla, it is necessary to enable him to expose it to the sun, for him to have large tables or stakes driven into the ground, on which it is easy to erect a light trellis of lathes,

so as to be able in case of rain to cover them with waxed or painted cloth.

Vanilla after having been dried gives about ⅕th. of its original weight.

A Vanilla garden which produces 500 Kilograms [about 1000 lbs.] can be carried on, according to my calculation, by 10 workmen, who, when well experienced, will suffice for the fecundation of the flowers. It would happen even that these workmen might be often employed on other work in the course of the year.

The Vanilla plants are renewed every 8 or 10 years. This however depends on the size of the cuttings planted and also on the localities where they have been grown.

There are still a quantity of other details which may be observed, but I think I need not indicate them, as these notes contain what is essential to be known for obtaining good results.

---

*Supplementary Notes on the Pamphlet of* M. D. De Floris;—*intended as a modification of the Vanilla Culture in India: By Capt.* W. H. Lowther.

I. The first mentioned,—known to Botanists as *Vanilla aromatica,*—yields the *best description* of produce and *bears more abundantly* than the *more showy large leaved V. planifolia,* of which plant I saw very few specimens in the *Vanilleries;* but about the town it is very common and seems to be preferred as a more *ornamental* if not *useful auxiliary* to *a frontage.*

II. The finest Vanilla creepers I have seen in Bourbon grow in the beautiful little gardens, and enclosures surrounding the villas and cottages of the capital, and cultivated in every possible form. *Sometimes,* festooning the tall, straight stem of a palm,—*sometimes* spreading wildly over an arbour; *now,* creeping vigorously over some damp, dark wall and in-

sinuating new germs in every hole and crevice; *now* composing an ever-green hedge, interwoven with laths, day by day on the symmetrical espalier; *frequently* found a neglected and dishevelled heap of runners, and pods, and *occasionally* an intrusive parasite overwhelming roses and lilies in an unchecked career: in truth, almost every house proprietor of St. Denis is a more or less grower of the costly aromatic.

III. In the delightful temperate climate of Bourbon, where shade, and moisture, temperature, and soil, are all beautifully balanced, very little preparation is requisite for the rapid formation of *roots* or cuttings; but, in the *most favorable parts of India,* it will be found indispensable to form healthy plants in a *nursery* previously to attempting a plantation.

IV. The system of *putting out adult plants* would hardly succeed *in India*; they would probably receive so severe a check, as to kill them down to their roots, which frequently occurs in Bourbon when suddenly transplanted to exposed localities in dry weather: too much *hand watering* can hardly be bestowed, *on the leaves and runners especially,* and the *intermediate watercourses should be kept flowing in dry weather all the 24 hours.*

V. The *proper kinds of trees* as *protectors* or *shade-givers,* is an experimental question for the Indian cultivator; he will find a larger variety to choose from than in Bourbon, and there are many among them which are easily produced in a few months by driving *well budded stakes* into the ground, as the *Peepul,* [*Ficus religiosa*] *Bauhinia, Ficus, Erythrina* &c. &c. The Jack and Mango, too (as in Bourbon), would yield a considerable profit from their fruit, they furnish more shade than most other trees.

I think I should prefer to form a plantation in some *virgin forest* having a considerable stream of water throughout its length, and where I could make immediate use of the *old shady trees,* to say nothing of a suitable soil, and moist cli-

mate. In central and lower Assam all these indispensable features of locality are abundant.

In Calcutta and its vicinity the *extremes of temperature are far too great* for a Vanilla grower.

VI. The *distance between the shade givers for India* must be greatly diminished, and it will be desirable that a portion of the trees *cast their foliage*: for this purpose none is better than the "*Erythrina*" (called in Assam "*Meddar*") and which is already so much employed in India in the plantations of *Pân, Pepper, and Coffee*; shedding its leaves when the sun loses his force, and recovering them when he begins to burn.

VII. The seasons in Bourbon are exactly opposite to those of India; hence *June, July, and August*, are *cold* months, and *planting out* is suspended during the above period: *for India*, as elsewhere, the proper time to transplant every green thing is when it gives sign of recommencing growth after the term of rest: thus, *February*, (*or the end of January in some seasons)* will be found the best time to begin a plantation. It is hardly possible to give *too much shade* during three fourths of the year, and the same with regard to *irrigation*. In the *Vanillerie* of Mons. Gausson, the produce of which in the past season sold for 70, or 80,000 *rupees*, the *natural forest* has been used for shelter, and even the *massive rocks*. The hill sides have been terraced at considerable expense and labour, serpentine paths being carried along conveniently through the heart of the estate, with a beautiful little river falling in cascades, and meandering through this artificial wilderness, and yielding an inexhaustible supply of the great necessity,—*water*. There are altogether 60 labourers of sorts and sizes, divided into classes, *each restricted to some particular operation* in the culture and curing, and paid according to their qualifications. There is not an *Espalier* in the whole estate, but the creepers are encouraged to climb in the most

natural manner from rock to rock and from trunk to trunk, the only access to these difficult supports being by bamboo ladders. In no other plantation is the plant so healthy or so productive, 50 to 60 pods in a single creeper being very common. The labourers are chiefly Madras coolies, the Negroes being found too lazy and stupid as gardeners. These plantations are situated between two lofty mountains, so that only *one half is touched by the sun* during the 24 *hours*. *For India* I should add *root shade* to promote moisture, and *ferns*, or *mosses* might be found useful for this purpose :—heaps of leaves, dried weeds, or straw are used here to protect new *Vanillèries* with the same object. *Water-courses* after the "*Koormie*" *fashion* of India, are very much employed in new plantations, with occasional tanks, and reservoirs for filling the watering pots. Those in use by Mons. Gausson are of copper, made to order in France, and holding several gallons, the rose being made very fine, and thus giving a well spread rain-like shower to the foliage.

VIII. Hardly applicable to an Indian *Vanillerie*, where I should prefer (as before stated,) plants *well rooted in a nursery to any cuttings whatever*.

IX. The fibres of plantains or *Pandanus Vacoa* are soft and strong as binders and usually fall off by decay, when the Vanilla has attached itself to the trees. I particularly observed a most useful application of the *P. Vacoa*: a rude basket was formed of its leaves, a foot and a half broad, and deep: a little drainage was placed in the bottom, and it was then well filled up with garden soil: after 2 or 3 waterings the earth was fit to receive a seed of Mango, or Jack, and in each of these baskets one was carefully sown, and the whole placed in regular rows near the water courses under partial shade; in a few months a nice portable plantation of useful shade trees was thus easily obtained, the baskets were carefully carried away in a mule cart, and planted out in the ground at intervals. Thus a fine healthy

collection of trees was speedily formed, the basket rapidly decaying in the ground without injuring its young inmate. *For India*, this system of sowing tree seeds seems to me admirable.

X A gritty, friable, but at the same time very rich soil is the one I should select, and it would not be very expensive to produce these properties *artificially*. I would prepare small pits previous to forming a plantation:—say 3 feet deep by 2 feet wide, these to be filled with a compost of two-thirds vegetable mould, and the other one-third a mixture of coarse sand and pounded stone or gravel, (of all sizes from a mustard seed to a pea): these pits to be watered daily; and all hollows and holes filled up, the surface of the pit soil being raised in the centre to about 8 inches above the ground level, the plant being very liable to rot if the drainage be imperfect.

In each of these pits I would place two healthy well rooted plants of a *foot* high (or in favourable localities two feet), watering them freely by hand before sunrise, and after sunset, and letting the intermediate watercourses run at least once a day when no rain falls. When firmly established I should give a slight surface manuring of decayed leaves, and half rotted stable dung; but this operation requires much attention and superintendence. On M. Gausson's estate the manure of several horses, mules, and cows, rotted with leaves, and jungle, is used once a year to stimulate the plants, the most vigorous season of growth. viz. the first appearance of blossom, being selected. *Liquid manure* would probably answer much better, but I did not find it in use.

XI. In India, where hot and pernicious winds are so prevalent, I should *(if not able to obtain a mountainous locality with a temperate climate)* choose a site with heavy forests immediately situate on the N. and E: and having bamboos, and plantain gardens on the S. and W. Air and sun however, will be required in moderation, and the plant will in this

respect require continual watching. As I before observed, a long, narrow valley between wooded mountains, matured by an inexhaustible stream, the soil ferruginous, and a climate where the thermometer rarely changes above or below 70, or 80 degrees, are the natural advantages to be sought for by the Vanilla grower.

XII. It is a well established fact, that *without artificial impregnation* of the blossoms not *one* in *one hundred* will set its fruit, and equally so that not *five per cent fail in doing so when the operation is properly performed,* while in its native forests of Brazil not only is the fecundation beautifuly executed by one of Dame Nature's small servants, a kind of bee, but the Vanilla pods are of a quality which the Bourbon cultivators have in vain tried to equal, and grow in all their primitive wildness ! Strange to say, nature has failed this season in S. America,. and the Bourbon planters are now reaping the golden reward of their labours. In India very great attention must be paid to the *proper hours of fecundation,* or extensive failure would be the result. Experiments on a small scale will soon establish the most suitable period for manipulation. For the rude hands of Hindoo gardeners, I would recommend a lancet like instrument of bone, or horn, and rather less blunt that a finger nail. Bamboo ladders too, will be required, where the "*tree system*" is followed, and which to my observation seems the proper one for India : true it entails more *labour* and *expense*. *but* this is amply repaid in the *quantity,* and *quality* of the produce, to say nothing of *protection* from thieves, and trespassers.

XIII. *Pruning* is as essential an operation in this branch of gardening, as it is in the akin employments of the orchard, or parterre : *one bundle of exquisitely perfumed,* and *well sized pods* is worth many, many times more in the commercial world, than a *dozen of inferior produce ;* and it is to these two main points that the Vanilla grower must direct

all his endeavours and abilities. The fame of this costly aromatic may be lost, or gained in proportion to the exertions and precautions of the grower, more particularly during the final process of preparation. The *number of pods* permitted to attain maturity on a single creeper will, of course, depend very much on the climate and corresponding vigour of the plant.

The delicate operations of *pruning, fecundation* and *gathering* are always specially entrusted to some *well tried*, and *well paid* individuals of the establishment, for extensive damage and loss would assuredly attend even trifling neglect.

*For India* I think the "modern fruit gatherer" (*on a much smaller scale*) would be the proper *modus operandi* in collecting the pods, which are irretrievably injured by a rude grasp, or clammy hands. This tool consists of a very sharp scissor like a pair of blades, attached to a little wire purse, or basket, and moved by a spring handle. The pods when cut off would be occasionally emptied into a pannier with a lid, and this should be taken away to the curing house when full, so as to avoid loss of aroma by exposure.

In India, where everything in vegetation ripens and rots at very short notice, depending on the sudden, and various changes of weather, very strict surveillance of the *ripening* will be necessary, and it is equally certain that the sun must not be trusted to the same extent as in Bourbon. Under a sky where everything *essential* and aromatic evaporates by exposure, it will be necessary to employ other modes of curing than by solar heat, otherwise there will be *loss of aroma* and *deterioration of shape* (perhaps also of *crystallization)* the most serious obstacles to ready sale. In *glass cases*, carefully adjusted to a sand bath in a shaded room, and guarded by a thermometer, it seems to me that the crystallizing process might be conducted in the greatest

perfection, and the external appearance of the pods rendered even *superior* to the Bourbon samples. What if Benzoic acid were delicately sublimated under the said glass covers, and thus thrown on the fruit in an acicular form?

[In a subsequent communication Capt. LOWTHER forwarded the following additional notes.]

1. Healthy plants in vigorous state of growth attain one inch per diem: a very simple index denoted 8 inches in the week. This was during warm showery weather.

2. The roots of the Vanilla plant require frequent attention. It will be as well to surround them with some effective guard against heavy floods of rain, or injury from accidents, for on them not only depends the health, but the very life of the creeper, which is not exactly a parasite or orchid as most people suppose. These are the first symptoms of radical disturbance. The cultivators bend downwards the main stem and peg it down as a layer, which soon strikes, and restores the health of the plant.

3. A well-managed plantation of *one acre,* being the enclosure of a small villa in St. Denis, yielded to the family inhabiting it 15,000 *francs* last season (6,000 Rupees.) Nothing can be more simple or inexpensive than this branch of cultivation, which is much followed as a profitable amusement by the ladies here.

4. *Too much shade* or *shade badly applied,* seems almost as prejudicial to a good crop, as the other extreme of exposure.

5. No plant should be allowed to bear too freely; the quality and size of the pods suffer thereby. The pruning should be proportioned to the age and health of the creeper: no more than 5 or 6 pods are allowed to a single cluster. A plant of 3 or 4 years growth has hundreds of blossoms thereon, but no more than *half a pound* of dried produce should be taken from the same. The pruning should be performed after the pods are fairly set, as in fruit gardening.

## *Notes on Cotton cultivation in Pegu.*

*(Communicated by Mr. R. W. Bingham from a Resident of Pegu.)*

The cultivation of Cotton in British Burmah, or Pegu, is at present at a very low ebb. The exports of raw material during the past official year were only of the declared value of £1298 : 10; and along the sea board, or in districts readily accessible from the out ports, English yarns have destroyed all demand for the native produce. From experiments that have been made in the neighbourhood of Rangoon, it would appear that those parts of the province that border on the sea are not favourable to cotton cultivation. In the gardens near this place, where the experiment has been tried, only a small proportion of the seed that germinates results in healthy cotton bearing plants; and in the Tenasserim Provinces, where experiments have been tried with all kinds of seed, the failure is complete. However, in the more inland districts, and between the 18th and 23rd degrees of North latitude, the soil and climate are well adapted for the purpose, and but for the operation of other causes, cotton could be grown there with facility, and of first quality. In fact in former times such was the case. From the Tharawaddy and Prome districts a large supply of the short staple kind was exported via Arracan to Dacca, where it was manufactured into those world famed fabrics, described by Mr. Crawfurd as "running water" and "woven wind." This species of cotton is still cultivated in those districts to a small extent. It is an annual, raised from the green seed variety, and requiring from 7 to 9 months from the sowing of the seed until the crop arrives at maturity. The staple is of a peculiarly soft and rich appearance, and even now nearly the whole produce is exported to Tinian for the Chinese markets. According to the records of the old Burmese customs, before that empire had entered upon its fatal contest with the English, the exports reached the large amount of 30,000000 (thirty milli-

ons) of lbs annually; and in after years our Resident at the court of Ava, Col. Burney, reported that Burmah exported to China fully 4,000000 lbs, and a like quantity via the Arracan mountains, Chittagong and Bengal. Such was the cotton cultivation in this province in former times. Recent political events, and the falling off of the population in Pegu, have resulted in the cultivation also falling off to such an extent that it can scarcely be said to exist. Before the British took Pegu it teemed with an active and strong population. That population is now estimated to fall short of 8,000000 souls, and these are grouped along the course of the Irrawaddy, and in the flat swamps of the delta between Bassein and Pegu; where rice cultivation, (from the great demand that exists for the grain, and the facility with which it is raised) affords ample occupation for the available labor of the country. The high table lands of the interior are almost a continuous forest, left entirely for the production of the timber which, next to rice, is the chief export of the province; and the localities and productions of which table land are literally known now to none but foresters. It was not always so. There are many remains in the heart of the dark wilds of Pegu, which tell of an active and teeming population in days gone by, and there seems no reason why such a population should not again exist in those places, if the political arrangements were such as to encourage the people to settle down, as they once did, and not to prefer to live in the much more lightly assessed, though more barbarous states that surround us. Another cause that operates largely against the cultitivation of cotton, is the decided preference the Burmese have for silk goods. There are scarcely any who are so poor as not to possess a suit of gaily coloured silk for festive occasions; and even for ordinary wear there appears to be quite as much silk as cotton in use. Attempts appear to have been made, at different places and times, to introduce the

cultivation of other varieties of cotton, besides the short fine staple that has been mentioned: and occasionally samples of the red naukeen kind are met with. But this is very sparingly the case; the Burmese evidently preferring the find kind for light cloths to be made up in imitation of their favourite silks.

To make Pegu a large cotton producing country, the first desideratum that would have to be provided for is, unquestionably, a large supply of labor. If this could be accomplished there would be no difficulty in converting the banks of the Irrawaddy, above the delta, into a vast cotton field, and the river itself, navigable as it is for upwards of 300 miles from the sea, would afford the best means of bringing the produce to Rangoon. But without a vast increase to the population nothing of the kind can be accomplished. The country is wonderfully prolific in every way.

It has vast mineral as well as vegetable resources, and all must remain undeveloped so long as the population is scarcely more than 12 souls per square mile on the averge, The rates for labor that prevail are so extravagant, for a tropical country, that a days work now and again is as much as the people care for; and those who have to conduct operations where labor is required on a large seale, are compelled to import laborers from Madras and Chittagong. Even such imported labor must necessarily be comparatively dear, and a very different state of things must be brought about before the inhabitants of the country will care to settle down to cotton cultivation.

RANGOON:
14*th July*, 1860.

### *A few brief directions to aid in the cultivation of Foreign varieties of Cotton in Northern India.*

Introduction.

The present crisis in the United Sates has naturally drawn greater attention to cotton culture in India. The Society have recently received a quantity of American seed from the Manchester Cotton Supply Association for which the names of applicants are now being registered preparatory to distribution at the commencement of next month. Upwards of forty applications have already (20th March,) been received, and in the majority of letters information is requested as to the best time for sowing, mode of sowing, and cultivation generally.

Preliminary remarks.

It would be foreign to the object aimed at in the following brief paper to enter into any disquisition respecting the early history of cotton, commercial varieties, genus and species &c. &c.; such subjects may be more appropriately introduced in the proposed *Essay on the culture of Cotton from foreign seed*, for which the Society intend immediately offering a prize of Rs. 500 as also one of the gold medals placed at their disposal by the Manchester Association. It is therefore now proposed merely to give a few brief directions which may aid some to whom cotton is entirely a new crop, and be also acceptable to others who have not had much experience in its culture.

Native mode of culture.

As a general rule the culture of cotton in India, as pursued by the Natives, varies considerably from the mode adopted in the United States, and the result is generally an inferior produce. In most parts of the country, the seed is sown broad cast, frequently with other crops; weeds are allowed to grow unrestrained, and the plants are closely crowded together. Moreover, the pods are permitted to remain on the plants after they have atttained maturity, frequently to fall on the

ground, whence they are taken up mixed with dirt. In some localities, however, as in the Southern Mahratta Country and in parts of Berar, a better mode of culture is observed, and consequently a superior produce is obtained.

Foreign kinds most desirable for culture.

The variety of cotton known as *New Orleans** would appear to be the most desirable description for general culture in Upper Bengal, Behar, and the N. W. Provinces; while the *Sea Island*† would seem better adapted for the Soonderbunds and for both sides of the Bay of Bengal.

Period of sowing recommended.

As a general rule indigenous cotton is sown in most parts of this side of India at the commencement of the rainy season; but in some localities the beginning of the cold weather season is the time chosen. For foreign cotton a short time previous to the setting in of the rainy season is the period generally recommended for sowing, say in the month of May, after two or three good falls of rain have somewhat moistened the previously prepared land.

Preparation of land.

The land set apart for cotton culture should be prepared in February or March before it becomes too dry and hard for the plough to penetrate; it should be well ploughed and all weeds carefuly removed. In the United States the ground is cast into ridges after ploughing, but objections have been raised to the ridge system in India, as "not only superfluous but injurious in a dry climate, for being raised and forming a comparatively thin stratum of earth, they [the ridges] must be heated and even baked by the powerful sun of India, and the tender radicles of the plant proportionally injured. Any rain which falls will also run off too rapidly

* A short staple green seeded kind, the cotton adhering rather closely to the seed.

† A long staple black seeded kind, the cotton hanging loosely and easily removed from the seed.

by the water furrow on each side of the row of plants, which, though beneficial in a moist, will be detrimental in a dry climate." So that this ridge system is not to be recommended beyond Bengal Proper where it may, probably, be advantageously adopted.

Mode of sowing and cultivating.

During the month of May, or June, according to circumstances, the seed should be placed in the ridges, the earth having been previously loosened. The ridges should be about 4 feet apart, and the seed some 2 to 3 feet apart, 3 to 6 seeds in each hole, according to freshness or otherwise, and at a depth of between one and two inches. A greater space between the ridges, as much as 6 or 7 feet, and a greater distance between each plant, is recommended by some cultivators, but this rule depends much on the kind of cotton to be cultivated and the character of the soil. The object to be attained is to grow the plants sufficiently far apart to prevent the branches interlacing, while, at the same time, they should be sufficiently close to shade the ground and so prevent excessive drying up. If more than two seedlings appear in the holes, they should, when they have put forth their third or fourth leaf, be removed to a nursery retained to fill up any future vacancies in the plantation; in about ten days after, one of these should also be removed: on no account should more than one plant be allowed to remain *in situ*. From 3 to 4 seers of New Orleans seed, if fresh, should suffice for one acre. Of Sea Island 5 to 6 seers may be necessary for the same area. If the seed be tolerably fresh and the weather favorable, it should germinate in a week. When the plants are well established, a hoeing should be given to keep the ground clean and to loosen the soil. It is an object to retain the soil loose, in order to allow the root (which is a tap one) to penetrate deeply, and so obtain a supply of moisture from a greater depth, and be better able to bear drought and vicissitudes of seasons. When

the plants are about 18 inches high the ground should be again hoed, if at all weedy, and the earth thrown up about the lower part of their stems.

Pruning. In about three months from the period of sowing, if the season has been favorable, and the soil suitable, the plants will have attained a height of about three feet, and commence flowering. In another 6 to 8 weeks the first crop of pods will ripen, or say in all October, by which time the rainy season is over and the cotton not liable to suffer from heavy moisture. If the cultivator finds that his plants are growing too luxuriantly, or too much disposed to produce wood and leaves to the detriment of flowers and pods, then it will be advisable to resort to *topping*, or in other words, to take off an inch or two of the top after they have commenced podding.

Picking. Equally as much attention is necessary to the careful gathering of the produce as to the previous cultivation of the plant: in fact too much attention cannot be given to it to ensure a good clean staple. As the time for the bolls to ripen approaches the cultivator must direct the pickers (women and children are generally employed in the United States for this purpose, as the labor is light) to enter the plantation about an hour or two before sunset, provided with three bags suspended from their shoulders. In one bag the largest pods should be placed, in another, pods of an ordinary size, and in the third such discolored or otherwise injured specimens as are obtainable either from the plants or from the ground. The pickers must be careful to lay hold of the pods only, without any dried leaves or bracts, as the admixture of such is very prejudicial to the quality of the cotton: it is the absence of such careful picking, as well as the defective mode of culture and removal of the cotton from the seed, that causes the bulk of native-grown Indian cotton to be so inferior. This operation must be performed daily till the whole crop has been gathered. Care must be

taken to remove the pods *just as they are about to open,* for, if allowed to remain another night and the following day, the dew and sun conjointly affect the staple considerably, making it dry and harsh. In some parts of the United States the pods are gathered before they have commenced to burst and then left to open in the shade, whereby the glossy appearance of the cotton is said to be improved. The seed from the largest pods is exclusivly reserved for next year's sowings, so as to prevent deterioration of produce. The discolored portion in the third bag, leaves, and other impurities, should be carefully picked out before this cotton is allowed to be mixed with the contents of the other two bags. After this careful examination has taken place, the cotton should be dried in the sun for a short time before ginning.

Manuring and irrigation.

A few words, in conclusion, on the subject of manuring and irrigation. In the Southern States of the Union the ground is "sometimes manured by running a deep furrow, early in the spring, between the old rows of cotton stalks [for cotton is treated as an annual and fresh seed sown every year, for though if the cultivator pleases he can allow his crop to stand for a second or even for a third year, it is not considered desirable to do so, because, even in the second year, the crop is defective both in quantity and quality, and more so in the third] which are beaten down into it by women and children who follow the ploughman; or well-rotted cotton seed is added as a manure, and well covered up by forming a slight ridge over it." In India manuring is seldom, if ever, resorted to for cotton; but that it would be desirable to do so, for this as any other culture, except in virgin soils, there can scarcely be a doubt, provided any kind of fertiliser can be obtained at a sufficiently moderate cost to warrant its introduction into the soil. Plants raised in moderately enriched soil would probably give a larger

yield, while they would be the better able to stand drought should the season be unusually dry, as was the case last year.

In respect to artificial irrigation much diversity of opinion prevails, some contending that, so far from improving the growth and staple of the cotton crop, it acts injuriously towards it, weakening the fibre, and reducing its value to a corresponding extent: while others, again, are in favor of its application, asserting that it proves beneficial rather than injurious in seasons when rains fail or vary in their supply. In Bengal, Lower Bengal especially, such a process is scarcely, if ever, required; but in Behar and the N. W. Provinces it would appear to be very beneficial whenever it can be resorted to. It is however extremely difficult,—nay almost impossible,—to lay down any fixed general rules in regard to the artificial irrigation of the cotton plant. Much, of course, must depend upon the nature of the soil and climate where the culture is carried on. In some localities, where the soil is sandy and light, frequent irrigation will probably be found necessary for the successful growth of the plant: in other places a moderate degree of moisture only is essential; while again, in other localities it may not be at all necessary, but on the contrary hurtful to the plant. In fact each cultivator must be guided by circumstances, according to soil and climate, whether to resort to artificial irrigation, or to leave nature to pursue her own course.

---

## *Further Correspondence respecting the cultivation of Flax in the North-Western Provinces.*

*(Communicated by the Government of India.)*

*From* LORD H. ULICK BROWNE,
*Under-Secy. to the Govt. of India.*

*To* A. H. BLECHYNDEN, ESQ.,
*Secy. to the Agri. and Horticultural Society, Calcutta.*

*Dated Fort William, the 25th March,* 1861.

Home Dept. Revenue.

Letter from Govt. N. W. P. No. 276, dated 4th Instant and enclosures.

Letter to do. No. 629, of this day's date.

SIR,—In continuation of my letter No. 1951, dated the 8th October last,* I am directed to transmit further Correspondence with the Government of the North-Western Provinces regarding the cultivation of Flax in those Provinces.

I have &c.,

H. ULICK BROWNE,
*Under-Secy. to the Govt. of India.*

---

*From* GEORGE COUPER, ESQ., C. B.,
*Secretary to the Govt. of the N. W. P.*

*To* W. GREY, ESQ.,
*Secretary to the Government of India.*

*Dated Allahabad, the 14th March,* 1861.

No. 2202, dated 3rd October, 1860.

No. 186, dated 24th January, 1861.

† No. 93, dated 15th February, 1861.

With reference to your Office letters of the numbers and dates noted in the margin, I am desired by the Lieutenant Governor to forward for submission to the Viceroy and Governor General in Council, copies of Dr. Jameson's report† on

* For previous Correspondence see pages 514—516 *Eds.*

the cultivation of the Flax plant and the manufacture of the fibre in these Provinces, and of the reply addressed to him under this date.

2. The Lieutenant Governor trusts that the preliminary measures, to which he has given his provisional sanction, may be approved by the Government of India, and he begs that in any case, the decision of His Excellency in Council may be made known direct to Dr. Jameson, who will be in Calcutta in route to England.

3. It will be observed that the Lieutenant Governor has confined himself entirely, for the present, to such measures as are required to place the Government in a position to give to the cultivation of Flax and the manipulation of the fibre the encouragement which appears to be contemplated in the 5th paragraph of your letter No. 2202, dated the 3rd October, postponing any application to the Commander-in Chief for the services of European Soldiers as Instructors for the reasons given in the letter to Dr. Jameson.

4. But the Lieutenant Governor desires me to take the opportunity of remarking that, though the practicability of growing the Flax plant successfully in the North-Western Provinces has been proved by Dr. Jameson's experiments of 1857, and of more recent date, the *manufacture* of the *fibre*, which is the greatest difficulty, has never, it is believed, been aided by the Government in these Provinces.

5. It may be quite true that the Punjab can *now* be left to its own progress unaided by the Government, but it should perhaps be borne in mind that, when the experiment was first commenced in the Punjab (in 1854), the Government agreed to take over the whole of the produce on its own account, and that an Establishment for the munufacture of the fibre was entertained under the superintendence of Mr. Steiner, a German, experienced in the art, who was employed until 1857, in (among other duties) giving to Natives instruction in the several processes of manipulation.

The same encouragement, it is believed, has never been extended to these Provinces, which therefore can hardly be considered to be on the same footing with the Punjab in respect of this matter.

6. And it seems to the Lieutenant Governor worthy of remark that no sooner was the direct encouragement of the Government withdrawn than the cultivation declined. Dr. Jameson reports in the 3rd and 4th paragraphs of his letter, dated the 15th ultimo, as follows :—" But in my late tour " (in Punjab) I ascertained that in almost every District " where the plant had been cultivated, unless that of Seal- " kote, it had been discontinued. The experiment therefore " so successfully begun was too prematurely abandoned. " No doubt the question that good Flax fibre can be raised " in the Punjab fitted for the Home markets has been solved, " and has thus passed from speculation to fact. But still as " far as the Natives of the country are concerned nothing " has yet resulted. The cultivation, instead of extending, " has diminished, and had not the Deputy Commissioner of " Sealkote taken up the subject with energy and activity, the " experiment would have been fruitless, or as remarked by " Mr. Cope would have died out in the Punjab of sheer " inanition."

7. Much to the same effect are the remarks contained in paragraphs 9 and 10 of Mr. McLeod's Report, No. 171, dated 15th February 1859. The dismissal of Mr. Steiner, and the discharge of the trained Establishments, led to the virtual abandonment of the enterprize. The Zemindars were " not sufficiently instructed in the matter to be able to effect either the cultivation of the plant in the mode necessary, or its conversion into fibre *without the aid of Establishments trained to the work;*" and while the seed continued to be in great demand, " the culture of the plant for the sake of fibre was virtually in abeyance."

*Vide* Enclosure of your letter No 2202, dated the 3rd October, 1860.

8. The foregoing facts have been stated in order to show that in my letter No. 138A, dated the 8th March, 1860, the Lieutenant Governor asked for no more assistance than had been granted to the manufacture of Flax fibre in the Punjab, and the citations in the two preceeding paragraphs have been made, in order to draw attention to the fact, that as soon as the direct encouragement of the Government was *withdrawn*, and the Instructors and the Establishments trained to the work of manipulation were discharged, the enterprize languished until, as Mr. McLeod writes on the 15th February, 1859, the culture of the plant for the sake of the fibre is virtually in abeyance.

9. With this example before us it is a question for the consideration of His Excellency the Viceroy in Council, whether if anything is to be tried for the production of Flax fibre fitted for the Home market, it should not be done in such a way as to produce lasting effects; to convince the people that with a little industry, perseverance and energy they have the means of adding largely to their own resources by sending into the market a most profitable article of commerce; and to guide them in their endeavours by showing them experimentally, and teaching them how the plant should be cultivated, and how the fibre should be manipulated.

10. The Lieutenant Governor, though he will readily avail himself at the fitting time of the suggestion, conveyed in Clause 3, paragraph 2 of your letter No. 2202, dated 3d October, would nevertheless be glad for the reasons which have been stated, if a more permanent character could be given to the Governmental encouragement of this project by the engagement of competent European Instructors, to be brought from England or Ireland; meanwhile His Honor hopes that the Viceroy and Governor General in Council wlll confirm the sanction which has been given to the formation of an experimental Flax field at Saharunpore;

to the importation of seeds of the best quality; and to the purchase of a few sets of such indespensable instruments as cannot be made up in this country.

---

*From* W. JAMESON, *Esq.*

*Superintendent, Botanical Gardens North-Western Provinces.*

*To* J. D. SANDFORD, *Esq.*

*Under Secretary to Government, North-Western Provinces.*

*No.* 93, *dated Saharunpore, the* 15*th February,* 1861.

BEFORE replying to your letter No. 1472A, dated 22nd October last, with enclosures, I deemed it necessary to examine what had been done regarding the cultivation of Flax in India, and particularly in the Punjab, preparatory to submitting a full and detailed Report. To do this I found, however, would be only going over a subject which had been fully investigated and exhausted by the late Dr. Royle in his work styled the "Fibrous plants of India," and by Mr. Cope in a paper lately published in the "Journal of the Agricultural and Horticultural Society of India, Part I., Vol. XI. of 1859."

2. In these publications full details will be found regarding all the experiments made on Flax cultivation throughout the country.

3. In the Punjab the subject had been taken up with energy and activity, and good results had been gained. But in my late tour I ascertained that in almost every district where the plant had been cultivated unless that of Sealkote it had been discontinued. The experiment therefore so successfully begun was too prematurely abandoned.

4. No doubt the question that good Flax fibre can be raised in the Punjab fitted for the Home Market, has been solved, and has thus passed from speculation to fact. But

still as far as the Natives of the Country are concerned, nothing has yet resulted. The cultivation instead of extending has diminished, and had not the Deputy-Commissioner of Sealkote taken up the subject with energy and activity, the experiment would have been fruitless, or, as remarked by Mr. Cope, would have died out in the Punjab of sheer inanition, and that too originating in three causes:

*1st.*—Want of preseverance on the part of the Local Government,

*2nd.*—Want of enterprize on the part of British Manufacturers, and

*3rd.*—Want of activity, energy and interest on the part of the Native cultivators in the progress and welfare of the country.

5. In a country like India, Government when desirous of introducing a new product or of rendering an old one by a process of cultivation unpractised before, valuable in the arts, must take the initiation in order to overcome the prejudices of the ignorant, indolent and slothful cultivators. There is no active and energetic middle class to direct and encourage the labors of the Native farmer; and it is a well known fact that even in Britain there is no class more difficult to persuade to adopt new and improved processes of cultivation, and new ideas regarding farming than the agriculturist, and had not the policy lately introduced opened up the country to Free Trade, the old and routine system of cultivating the land would have by thousands been continued to this day.

6. The British farmer is now compelled by the free importation of grain to resort to high and scientific cultivation, and the best manures in order to enable him to hold his own.

7. Messrs. Mechi and others, through means of their private experimental farms, have shown to their tenants and tenant farmers how to maintain their position even

though the British markets be extensively supplied with untaxed thread stuffs from abroad. In this country such spirited individuals are unknown, and therefore any thing to be introduced for its improvement must be initiated by Government. The system at present followed by Native farmers in cultivating Flax for its seed, is miserable in the extreme, the shove or straw from whence the fibre is obtained being either used as fuel, or broken up and mixed with other substances and given to cattle. Let Natives be shown that substantial advantages would accrue to them by cultivating the Flax properly, and that a good marketable fibre can be obtained from it, for which there is always a ready and immense market, and I doubt not but that they would soon take to the cultivation. But though the cultivation in the Punjab has in most places retrograded, yet still beneficial results have ensued from the experiment instituted by Government which may be of immense importance to the country.

8. By the exertions of Mr. D. McLeod and others, the experiment was prominently brought to the notice of the Flax Manufacturers in Britain, where for years the supply of Flax from Home cultivation and Foreign importation has been far short of the demand, and samples of the fibre laid before them which were pronounced as worth £55 per ton, and so satisfied were they by the specimens exhibited, that the Punjab was fitted to grow Flax suited to the Home Market, that they formed a Company, "The Indian Flax Company Limited of the Punjab" in order to carry it on, and their Agent Mr. Wightman has now settled in the Sealkote District, and has commenced operations. By him advances have been made to Zemindars to cultivate Flax which they will re-pay him back in kind. He too has distributed acclimated seeds, and has applied to me for a large supply to extend his operations, which however I cannot meet. Land of his own, he has none, and he is therefore

entirely dependant on Native cultivators. The system introduced is an admirable one, and will continue to be so as long as the Company consider the interests of the Native cultivator as well as their own, or in other words give him a fair remuneration for his labor. If this be done, and if the superitendence be confined to advice in the manner of cultivating the plant properly and preparing the fibre, and the distribution of acclimated seeds, and above all in a newly acquired country like the Punjab where the inhabitants look to the District Officers as their best advisers, if the countenance of Government through the District Officers be continued, flax cultivation will rapidly spread, and the fibre become an important article of exportation.

9. But as yet the small success gained in the Punjab, is not in my humble opinion sufficient to stimulate private enterprise to seek a field for operations in the North-Western Provinces.

10. The services of Mr. Cope are not available, or if were, they could only be procured at a rate which Government would not be prepared to meet. By him extensive mercantile transactions are carried on at Amritsur, and thus his time is fully occupied, nor is he acquainted with the methods of preparing flax.

11. To grow the plant, assistance is not required—this we can do—what are wanted are—

1*st*.—Good scutches and hecklers—men intimately acquainted with the processes of manipulation, and fitted to teach the natives of the country.

2*nd*.—A large supply of acclimated seeds.

3*rd*.—The best kind of machinery used in preparing flax.

4*th*.—The directions for the proper management of the flax crop compiled by the Committee of the Royal Society for the promotion and improvement of the growth of flax in Ireland, with a few alterations and modifications to suit the climate of the North-Western Provinces, might be translated into Hindee, printed and distributed to Native culti-

vators through District Officers with much advantage. I append a copy of the Society's directions altered to suit the climate of this country, and at the same time, amended from practical experience obtained by cultivating the plant for many years at Saharunpore.

12. In the work alluded to all the information required on flax cultivation is to be found, and the Agricultural and Horticultural Society of Calcutta, by publishing the most important information to be found in the reports of Transactions of the Royal Society for the promotion and improvement of the growth of flax in Ireland, have done all that is required to popularize the culture so far as that can be done by the press, and in Dr. Royle's work on the Fibrous Plants of India, the cultivator will find the same information condensed. To him therefore I would recommend this work as a text book.

13. Prizes have already been offered by the Punjab Government for the best samples of prepared fibre, and for the largest quantity of land brought under cultivation with Flax, but with no beneficial results, as they remain unclaimed by any one. Such an inducement held out appears to be of doubtful utility, though it might with much advantage be done on a small scale by District Officers.

14. In the magnificent system of Canal irrigation, the North-Western Provinces has the means for Flax cultivation far superior to that possessed by the Punjab, and to encourage it therefore and meet the demands for acclimated seeds on an extensive scale, I would respectfully recommend that an experimental farm of from 50 to 60 acres be formed in the Saharunpore District adjoining the garden, where irrigated land can be procured at a reasonable rate, that the incidental expenses, such as land-rent, water, &c., be met by the sale of the seeds, a certain quantity being reserved for District Officers for distribution to Zemindars.

That if European Instructors be available in this country,

two men be obtained from the rank of any Regiment for a short time to prepare the fibre and teach Natives how to scutch and heckle.

That the fibre be sold when prepared to meet the wages of the parties who prepare it, a large sample being reserved for exportation and examination by British Manufacturers.

That acclimatized seeds be given to District Officers, particularly those whose Districts are in part irrigated by Canals, to distribute to Zemindars, and that all Zemindars repay in kind with the shove or straw the value of the seeds received.

And that small rewards such as those distributed by the Deputy Commissioner of Sealkote be given to such cultivators as present the best sample of flax plants for scutching. These rewards were received with the greatest satisfaction by the cultivators at Sealkote, the more so as they were distributed publicly to the recipients by their own District Officers.

15. For the plants raised by Zemindars and fitted for preparing fibre there might at first be difficulty in procuring a market, but the finest samples might with advantage be purchased by Government, and from them fibre prepared for the market as an encouragement to the best cultivators. This of course could only be done to a limited extent, but when the field became extensive, it would be high time for the Government to discontinue the experiment, and hand it over to private Capitalists.

16. But the seed alone would ensure the Zemindars from any loss. In fact he would only be doing, though with better seeds, what he is now doing; flax of inferior quality and quite unfitted for preparing fibre being cultivated everywhere.

17. In the Punjab both Mr. Wightman and Mr. Cope are prepared to purchase all fibre of good quality, and were it shown that flax capable of producing good fibre could be

grown in the North-Western Provinces, capital and funds to work it would no doubt be forthcoming to take it up.

18. To do this it would be necessary to import some good seed from Livonia or Kurland, from which all the best Dutch seeds are procured; to the acre about two bushels or 1¼ maunds, are required; I would therefore recommend that a ton or 28 maunds be imported, which with the acclimated seed that will be available this season, would enable me to cultivate 50 acres of land, an ample extent to spread the seed over the country.

19. When the Hon'ble the Lieutenant Governor visited the garden last season, he saw two fields under cultivation with those, the one with Russian seeds, the other with indigenous seed, and the plants of the former were from 3½ to 4½ feet; the latter only 2 to 2½ feet.

20. From the former seed a supply was sent to Mr. Cope, then Secretary to the Agri-Horticultural Society of the Punjab, and from it dates the commencement of the experiment of Flax cultivation in the Punjab.

21. Into the Punjab, Flax seed was imported in quantity, but, owing to it having been badly packed, it failed to germinate. The Hon'ble the Lieutenant Governor having granted me leave to proceed to England for a few months, during my sojourn there I would gladly make arrangements to procure the machinery used in preparing Flax, and the best kind of seed, and at the same time ensure its being well packed. I too intend to visit the Flax Districts in Ireland and the Linen Factories in England and Scotland, in order to examine the machinery there employed. If therefore I can usefully employ my time in procuring such implements and machinery as are necessary for the purpose, being well aware of the requirements of the North-Western Provinces, I shall have much satisfaction in doing so.

---

## APPENDIX.

*Directions for the proper Management of the Flax Crop compiled by the Committee of the Royal Society for the Promotion and Improvement of the growth of Flax in Ireland.*

*Soil and Rotation.*—By attention and careful cultivation good Flax may be grown on various soils, but some are much better adapted to it than others. The best is a sound, dry, deep loam with a clay sub-soil. It is very desirable that the land should be properly drained and subsoiled, as when it is saturated with either under-ground or surface water, good Flax cannot be expected.

It is not considered generally advisable to grow Flax more frequently than once in ten years; not because it exhausts the land more than other crops, but because good Flax cannot be had at short intervals on the same soil. In Belgium, it invariably follows a corn crop, and in this country it can with much advantage follow wheat, the ground being allowed to be fallow during the rains.

*Preparation of the Soil.*—One of the points of the greatest importance in the culture of Flax is by thorough draining, and by careful and repeated cleansing of the land from weeds, to place it in the finest, deepest and cleanest state. This will allow the roots to penetrate, which they will often do to a depth equal to one-half of the length of the stem above ground.

One ploughing will be sufficient on light friable loam, but two are better; and in stiff soils three or four are advisable. Thus one before the rains set in, two during the rains, and one in October, or before sowing to destroy all weeds, and thus save a great deal of trouble in after weeding. After ploughing, pass the Mairah over the ground, so as to break all clods of earth, and make the land smooth.

*Sowing and the best kinds of Seeds.*—The seed best adapted for sowing are acclimated Russian seeds, and in select-

ing them care should be taken that they are plump, shining and heavy. They ought before sowing to be sifted, and all the seeds of weeds carefully separated from them. In sowing, sow from ten to twelve seers to the Kutcha Beegah. It is better to sow too thick than too thin, as with thick sowing the stems grow tall and straight, and the fibre is found greatly superior in fineness and length to that produced from thin sown Flax, which grows coarse and branches out, producing much seed, but an inferior quality of fibre. The ground being well pulverized and well cleaned, and smoothed by the Mairah, let it be sown either in drills or broad cast.

*Manure for the Flax Crop.*—As the flax requires good strong land, it ought to be well manured before the seeds are sown, *viz.* from 40 to 50 cartloads per acre.

*Weeding.*—This can be done by women and children, and by them care ought to be taken to weed in the direction, (*viz.* South-East to North-West,) contrary to the prevailing winds, in order that the plants trampled down by the weeders may be blown up again, or thus be assisted in gaining their upright position. The tender plant pressed one way soon recovers, but if twisted or flattened by careless weeders it seldom rises again, and is thus liable to be destroyed. Two weedings are generally ample, but this depends much on the state of the land where the Flax is sown, and the cleanness of the seeds.

*Pulling.*—The time when Flax should be pulled is a point of much nicety to determine. The fibre is in the best state before the seed is quite ripe. If pulled too soon, although the fibre is fine, the great waste in scutching and stocking renders it unprofitable; and if pulled too late, the additional weight does not compensate for the coarseness of the fibre. It may be stated that the best time for pulling is when the seeds are beginning to change from a green to a pale brown colour, and the stalk to become yellow, for about two-thirds

of its height from the ground. When any of the crop has been lying, and suffering from wet, it should be pulled as soon as possible, and kept by itself. If the Flax plants be of different lengths, each length ought to be collected separately, and steeped separately. When there is much second growth, the Flax should be caught by the puller just under the bolls, which will leave the short stalks behind, and if the latter be few, it is best not to pull them at all, as the loss from mixture and discoloration by weeds would counterbalance the profit. It is highly essential to take time and care to keep the Flax even like a brush at the root ends. This increases the value to the spinner, and of course, to the grower, who will be amply repaid by an additional price for his extra trouble. Let the handsful of pulled Flax be laid across each other diagonally to be ready for the *Rippling,* which should be carried on at the same time and in the same field with the pulling. The ripple consists of a row of iron teeth screwed into a block of wood, and can be made by any handy blacksmith. It is to be taken to the field, where the flax is being pulled and screwed down to the centre of a nine feet plank resting on two stools. The ripplers may either stand or sit outside at opposite ends. They should be at such a distance from the comb as to permit their striking it properly and alternately. A winnowing sheet must be placed under them to receive the bolls as they are rippled off; and then the ripplers are ready to receive the flax just pulled, the handsful being placed diagonally, and bound up in a sheaf. The sheaf is laid down at the right hand of the rippler, and untied. He takes a handful with one hand, about six inches from the root, and little nearer the top with the other. He spreads the top of the handful like a fan, draws the one-half of it through the comb, and the other half just the side; and by a half turn of the wrist the same operation is repeated with the rest of the bunch. Some however, prefer rippling without turning the

hand, giving the Flax one or two pulls through the comb according to the quantity of bolls. He then lays the handsful down at his left side, each handful crossing the other, when the sheaf should be carefully tied up and removed. The object of crossing the handsful so carefully, after rippling, when tying up the bundles for the steep, is in order that they may part freely from each other, when they are taken to spread out in the grass, and not interlock, and be put out of their even order, as would otherwise be the case. If the weather be dry, the bolls should be kept in the field spread on mats, and turned from time to time. If the weather be rainy, they should be taken in doors and spread out thinly on mats and turned twice daily. In fine weather the bolls ought always to be dried in the open air, and the heaviest and plumpest kept for sowing. Flax ought not to be allowed to stand in the field, if possible even the second day; it should be rippled as soon as pulled, and carried to the water as soon as possible, that it may not harden.

*Watering.*—This process requires great care and attention. River water is the best. If spring water be used, let the pool, which ought to be from 12 to 18 feet in length, and 3½ to 4 feet deep, be filled, and the water remain a short time before using it. Place the Flax loosely in the pool, in one layer, somewhat sloped, and in regular rows with the root end underneath, the tie of each row of sheaves to reach the roots of the previous one, place stones so as to sink the Flax a little in the pond, and as fermentation proceeds, increase the weight to prevent it rising, a small stream of water allowed to run through the pool, has been found to improve its colour. In this case if the pools are in a line the stream should be conducted along the one side, and thus run into each pool separately, and the water run off in the opposite side in a similar manner. It will be sufficiently steeped in from 36 to 48 hours, but this will depend entirely

on the heat of the weather, and the nature of the water. Every grower should learn to know when the Flax has had enough of the water, as a few hours too much may injure it. The best test is the following:

Try some stalks of averge thickness, by breaking the shove, or woody part, in two places about six or eight inches apart; at the middle of the stalk catch the broken bit of wood, and if it will pull freely out, downwards, for that length, without breaking or tearing the fibre, and with none of the fibre adhering to it, it is ready to take out. Make this trial every two or three hours after fermentation subsides, for sometimes the change is rapid. It is advantageous to let the Flax drain for four or five hours, after being taken from the pool, by placing the bundles on their root ends close together, but the heaps ought not to be too large, otherwise the Flax is liable to be injured by heating.

*Spreading.*—Select where possible clean short grass land for this operation, removing any weeds that rise above the surface of the sward. Lay the Flax evenly on the grass, and spread thin and equally. Turn it two or three times while on the grass with a rod eight feet in length and 1½ inches in diameter, that it may not become of different shades by the unequal action of the sun, which is often the case when this is neglected.

*Lifting.*—If the weather is dry 8 to 10 days and if showery 4 to 6 days, will be ample on the grass, a good test of its being ready to lift is to rub a few stalks from the top to the bottom, and when the wood breaks easily, and separates from the fibre leaving it sound, it has had enough of the grass. Also when a large proportion of the stalks are perceived to form a bow and string from the fibre contracting, and separating from the woody stalk. But the most certain way is to prove a small quantity with the hand break, or in a Flax Mill. In lifting keep the lengths straight, and the ends even, otherwise great loss will occur

in the rippling and scutching. Let it be set up for a few hours, and afterwards tie it up in small bundles; and if not taken soon to be scutched, it will be much improved by being put up in small stalks loosely built with breeches and branches of trees at the bottom to keep it dry, and allow a free circulation of air.

*Drying.*—Exposure to the sun is sufficient for all purposes.

*Breaking and Scutching.*—This is either done by the hands or by mills, the latter being much the best. For India therefore it would be necessary to import them.

The above is a condensed view of the directions for preparing Flax issued by the Royal Flax Society. Of course without the improved machinery now used, it would be impossible to prepare Flax of first-rate quality.

---

*From* G. COUPER, ESQ.,
*Secretary to the Government of the North-Western Provinces.*

*To* W. JAMESON, ESQ.,
*Calcutta, No.* 274, *dated Allahabad, the 14th March,* 1861.

I AM desired by the Hon'ble the Lieutenant Governor to acknowledge the receipt on the 4th instant, of your letter No. 93, dated 15th ultimo, and to thank you for the information and the suggestions which it contains.

2. The experiments which have been carried out in the Punjab, and also in a smaller scale in the North-Western Provinces, under your own direction, afford sufficient proof of the success with which Flax of good quality may be grown in India, and perhaps the system of Canal irrigation which obtains in these Provinces places them in a more favourable position for the production of the raw material than the Punjab.

3. But it has been found from experience in the Punjab that the direct encouragement of Government is required to induce Native cultivators to persevere in the cultivation of this crop, and that as soon as such encouragement is withdrawn, the cultivation diminishes. This is one difficulty to be contended against.

4. But the chief difficulty lies in the making Native cultivators acquainted with the nature of the fibre as an article of commerce, and in instructing them as to the various manipulating processes, to which the fibre must be subjected before it is fit for the market. Many, indeed most of these, are in themselves very simple, but they require close attention to details, and trifles, which the ignorant Native producer can, with great patience and difficulty only, be taught to consider important, as they really are.

5. It is not to be doubted that good flax fibre can be produced in India, and Mr. Robert's words are quite true that "this question has passed from speculation and surmise to fact," but still it must be remembered that this was not accomplished without direct aid from the Government in the employment of an "imported Instructor" in the person of Mr. Steiner, who superintended the preparation of the fibre, which was so highly appreciated in the Home markets, and who was employed for a long time in teaching Natives the various processes of manipulation. The like advantage, so far as the Lieutenant Governor is aware, has never been extended to these Provinces.

6. Adverting apparently to the 4th paragraph of Mr. Grey's letter No. 2202, dated the 3rd October, 1860, you state that, even if the services of Mr. Cope were available, (which they are not,) they could not be procured for any remuneration which the Government would consent to give, and that after all, however well acquainted with the cultivation of the plant, he has no knowledge of the processes required in the preparation of the fibre. In point of fact

the growth of the plant is an easy matter. It is the preparation of the fibre which alone presents difficulty, the removal of which you think can be brought about only by the direct action of the Government.

7. In this view the Lieutenant Governor entirely agrees, and seeing that the suggestion contained in the first clause of paragraph 5 of Mr. Secretary Grey's letter above cited, has been anticipated to a great extent by Dr. Royle's work on the Fibrous Plants of India, by the publications of the Agricultural and Horticultural Society of Calcutta, and by the recent work of Mr. Cope, His Honor proceeds to consider the various proposals submitted in the 14th paragraph of your report.

8. These resolve themselves into *first,* the formation of an experimental farm at Saharunpore, the incidental expences of which shall be defrayed from the sale proceeds of the seeds; *secondly,* the transmission of acclimated seeds to District Officers for distribution to Zemindars, who shall repay the value thereof in the straw; *thirdly,* in the employment of two Europeans to be obtained from the ranks of any Regiment serving in India, in the preparation of the fibre, and the instruction of Natives in scutching and heckling; *fourthly,* in the distribution of small rewards for the best samples of flax plants for scutching.

9. In their spirit these proposals are somewhat opposed to the sentiments expressed in Mr. Secretary Grey's letter above referred to, in asmuch as these contemplate the withdrawal of Government from direct concern in an undertaking which should be left to private enterprize. But as the first step must be to provide good seed and acclimatize it; as this must devolve upon the Government; as the aid of Government to private experiments in the way of getting good seed, and importing machinery is countenanced in clause, 2, paragraph 5 of the instructions just cited; the Lieutenant Governor does not think that it will be inconsis-

tent with the orders of the Government of India to take up land for the production and acclimatization of Flax seed of the best quality.

10. Subject therefore to the confirmation of the Government of India, the Lieutenant Governor authorizes you to take up 50 acres of land in the immediate proximity to the Botanical Garden at Saharunpore for the purpose above indicated, and as, you are about to proceed to England on sick leave, he requests that you will communicate to your *locum tenens* such directions for the enclosure of the land, and the preparation of the soil during your absence, as may be requisite. At the same time the Lieutenant Governor authorizes you, while in England, to provide for the exportation to this country of one ton of the best Flax seed, and to purchase half a dozen sets of such necessary implements as cannot be made up in this country. The expense of these preliminary measures will be very inconsiderable, and without them it will be imposible for this Government to give encouragement to the cultivation of the plant, and the manufacture of the fibre even in the limited degree contemplated by the letter from Mr. Secretary Grey No. 2202. dated the 3rd October last.

11. Beyond this the Lieutenant Governor does not think it advisable at the present time to proceed. After the seed has been imported, and you yourself have resumed your duties at Saharunpore, it will be time enough to set about the encouragement of European Instructors, and the offer of rewards to Native cultivators for the best samples of produce, and other subsidiary matters. What the Lieutenant Governor now aims at is merely preliminary, intended to place this Government in such a position as to enable it to give to the cultivation of Flax for fibre the encouragement which the Government of India seem to consider legitimate, and which the great importance of the undertaking deserves.

12. The Lieutenant Governor will for the present post-

pone the translation and publication of "the Directions for the proper management of the Flax Crop" which are enclosed in your letter. The paper contains terms unknown to the vernacular language, and could hardly be made intelligible to Native cultivators without the aid of actual demonstration; and for this, as well as for other reasons inferrible from what has been said in the preceeding paragraphs, it will be better to reserve the publication until your return from leave of absence.

---

*To* G. Couper, Esq., C. B.
*Secretary to the Govt. of the North-Western Provinces.*

Home Department Revenue.

Sir,—I am directed to acknowledge the receipt of your letter, No. 276 dated the 14th instant forwarding a report by Dr. Jameson on the cultivation of the Flax plant, and the manufacture of the fibre in the North-western Provinces, and in reply to state that the Governor General in Council approves of the Lieutenant Governor having authorized Dr. Jameson to take up 50 acres of land in Saharunpore for experimental Flax cultivation.

2. Dr. Jameson being about to proceed to England the Lieutenant Governor has requested him to provide for the exportation to India of a ton of the best Flax seed and of half a dozen sets of such necessary implements as cannot be made up in this country. This is also approved.

3. As requested in your letter the purport of these orders has been communicated to Dr. Jameson.

I have &c.

Dated Fort William : (Signed) H. U. Brown.
*The 25th March,* 1861. *Under Secy. to the Govt. of India.*

## Correspondence and Selections.

A SUMMARY OF REPLIES RECEIVED FROM MAGISTRATES RESPECTING THE OUT-TURN OF VEGETABLE SEEDS SUPPLIED IN 1859, FOR JAIL GARDENS, THROUGH THE A. AND H. SOCIETY.

Supt. Allipore Jail, 27th July, 1860. Seeds of last year vegetated very partially and scarcely rendered any return.

Does not think the Jail at Allipore suited for foreign seeds, being so immediately affected by the tidal stream through Tolly's Nullah.

Asst. Com. of Chyebassa, 26th July. Seeds of last year succeeded very well.

Offg. Magt. Hoogly, 26th July, Jailors' Report. Some seeds succeeded well, others not at all, all would no doubt have turned out well in good soil, which the Hoogly Jail Garden does not possess. The French beans were a complete failure.

Offg. Joint Magt. Nuddea, 30th July. Exceedingly satisfactory return, the seeds yielding a most profitable crop.

Magt. of Mymensing, 28th July. The whole of the seeds supplied last year vegetated well.

Asst. Magt. Dinagepore, 31st July. All the vegetable seeds vegetated freely and yielded plentifully, except beans and Indian corn.

Offgt. Magt. Chumparun. Has no Jail garden, sold half the seed supplied to him and sent the rest to the Magistrate of Monghyr. One of the boxes of seed sold was badly packed, and some of the seeds damaged by damp; those that did not suffer, especially beet, and cauliflower, succeeded admirably.

Magt. of Burdwan, 31st July. Seeds of 1859, with a few exceptions, germinated well.

Asst. Comr. Akyab, 6th August. All the seeds, (except beet and onion which failed entirely) germinated well.

Magt. Sylhet, 2nd Aug. All turned out well and produced good crops with exception of peas of which none but the marrow fat germinated.

Magt. of Goalparah 7th Aug. Seeds of last year germinated well.

Offg. Magt. of Midnapore, 13th Aug. Seeds of last year yielded a fair return with the exception of onions and beet root.

Magt. of Kamroop, 8th Aug. All the seeds yielded rich crops with exception of spinage, melon, onion, and two or three others, including tobacco.

Joint Magt. of Purneah, 8th Aug. Seeds of last year all yielded a fair crop.

Magt of Rajshaye, 8th Aug. — Seeds turned out very good and yielded most favorable crops from November to April.

Principal Asst. Com. Maunbhoom, 7th Aug. — Cabbage, peas, carrot and tomato turned out moderate crops. Radish and beans good; other seeds did not germinate at all.

Magt. of Rungpore, 6th Aug. — Cauliflowers, cabbage, knolkole, lettuce and peas turned out well, turnips, carrots, and French beans failed, failure attributable to too late sowings.

Offg. Magt of Dacca, 8th Aug. — Seeds supplied last year of superior quality and germinated very freely with exception of French beans. American superior to Cape.

Offg. Magt. of Tirhoot. 8th Aug. — Radish, turnips, cabbages and peas only came up last year.

Magt. of Tipperah, 7th Aug. — Succeeded very well, particularly the cabbages, peas, turnips, lettuces and French beans.

Magt. of Beerbhoom, 17th Aug. — Turned out very well with exception of onion.

Offg. Magt. of Teapore, Upper Assam 9th Aug. — Seeds did not turn out well or yield a good crop; not the fault of the seeds, but of the soil; garden situated in an unfavorable locality.

Offg. Jt Magt. Tipperah, 13th Aug. — Cabbages, lettuce, peas, and beans yielded good crops. Turnips and other exotic seed do not seem well fitted for the soil and their produce is comparatively small.

Magt. of Patna, 20th Aug. — Cabbages and cauliflowers, beans, radishes, turnips and carrots gave good crops; the other seeds did not vegetate to any extent, soil well suited for all kinds of Europe vegetables.

Magt. of Monghyr, 20th Aug. — Some of the seeds produced a scanty crop, others no return at all; but no details kept Seeds to be sown this year in a better piece of ground under Magte's. direction and superintendence.

Magt. of Nowgong, 9th Aug. — Received in too damaged a state to get any return.

Magt. of Balasore 11th Aug. — An unsuitable soil, chiefly of sand, for the growth of European vegetables. Peas and beans failed entirely, and several other seed, produced weakly plants, except cabbage, which resulted very favorably,

Magt. of Baugulpore, 21st Aug. — Seeds supplied last year yielded very good crop.

Magt. of Debrooghur, Upper Assam 6th Sept. — Seeds of last year did not turn out well.

Principal Asst. Comr. of Sandoway, 16th Aug — Seeds of last year turned out very well.

Offg. Magt. of Chittagong, 5th Sept — Seeds of last year yielded good crops as far as he has been able to ascertain.

## ON THE NATURAL HISTORY OF THE LAC-INSECT (COCCUS LACCA). BY H. J. CARTER, ESQ., F.R.S.

Having had an opportunity of examining the Lac-insect just previous to the evolution of its young, and of watching the latter from this period up to the time at which they become incarcerated in the resinous substance which they secrete around themselves, known in commerce by the name of "lac," and finding that a description of the changes which the insect undergoes still remains unpublished, so far as I am aware, while that which has been stated on the subject is more or less incorrect, I am not without hope that the following observations may prove both new and acceptable.

Thus much is known:—that the substance called "lac" consists of a resinous incrustation partly encircling or scattered over the small branches of several trees and shrubs of different kinds in India; that the incrustation is cellular, and that each cell indicates the position of one of the insects which secreted it; that the insect contains a red colouring matter called "lac-dye," which is also an article of commerce, and is allied to cochineal: and that, at a certain period of the year, vast numbers of young animals leave these cells and, spreading themselves over the neighbouring branches, fix themselves to the bark, which they pierce with their beaks, and then begin to pour forth from their bodies the resinous substance above mentioned.

On the 25th of June last (1860), my attention was drawn to the subject more particularly by a fresh branch of the Custard-apple tree (*Annona squamosa*), bearing portions of the lac, having been presented to me by my friend Major Burke. The branch was taken from a tree growing in the enclosure of the Bombay Mint, within a few yards of the sea, and in the midst of the smoke of steam engines, smelting-furnaces, and the atmosphere of a crowded population; while the resinous incrustation and the red colouring matter, both in quality and quantity, did not appear to me to be less than that which is produced by the insect in localities widely separated as well from the sea as from all human habitations.

On receiving this branch and observing that it was fresh, and that the insects in the incrustation were also living, my curiosity was directed to ascertaining the form and organology of the latter. Meanwhile the young began to pour forth—that is, on or about the 1st of July; and by the middle of that month the whole branch had become covered with them; but, for want of nourishment, as they became stationary, so they died without apparently secreting any of the

resinous substance around them; and thus I was obliged to visit the Custard-apple tree itself for the purpose of examining the subsequent changes which the insect undergoes,—which changes, together with a description of the form and organology of the full-grown insect, so far as I have been able to ascertain them, will now be related.

The first feature that strikes the eye on looking at the surface of the incrustation, when the insects which are within it are alive, is the presence of a kind of white powder, like that observed about the cochineal-insects; this is concentrated here and there into little spots and on being more closely examined will be seen to be chiefly confined to three bunches of curly, hair-like filaments, which radiate from three small holes in each spot. The holes are situated triangularly with respect to each other, two being closer together than the third, which is the largest, and which, by and by, will be found to be the anal, while the other two will be found to be spiracular apertures: all three are continuous with corresponding apertures in the insect, from which the white filaments originally proceed, which filaments we shall hereafter observe to be the attenuated extremities of the tracheæ.

If we now examine the contents of the interior, which we may easily obtain entire by dissolving off the lac in spirits of wine (for, from their tenderness, they can hardly ever be extricated without rupture by simply breaking the incrustation), it will be observed that each cell is filled with a single insect, which is now almost as much unlike one as any object can well be unlike another,—consisting of a pyriform sac of a dark-red colour, smooth, shining, and presenting at its elongated end one, and at its obtuse end three papillary processes: the former, which is a continuation of the elongated end, is fixed to the bark; and the three latter, which project from the middle of the obtuse end, are respectively continuous with the three holes in the lac above noticed. As with these holes, so with the three processes: one is much larger and longer than the other two, which latter are of the same size; the former is also further distinguished by having several hairs round the margin of the aperture which exists at its extremity,—a point which it is desirable to remember, as it will serve by and by to identify it with the anal extremity of the animal when in its insect form.

So far the spirit of wine assists; but when we come to the contents of the body, it is not only necessary to avoid using spirit of wine, from the disfiguration which it occasions by causing the tissues to contract, but also to extricate the body by fracturing the lac, and

dissect its contents as quickly as possible, on account of the rapidity with which they pass into dissolution after death: this is probably the reason why this part of the history of the insect has remained unpublished up to the present time.

Directing our attention to the interior, after the rupture of the insect, which takes place more or less with that of the lac, we are at once struck with the voluminousness of the organ containing the red colouring matter, which organ thus obscures everything else; and it is not before a quantity of it is removed by gentle edulcoration that we can (still under water, for the anatomy of this insect can be studied in no other way) arrive at a view of the other organs of the body, when it will be observed that there is an alimentary canal, liver, tracheæ, and, last of all, the organ containing the red colouring matter, which we shall presently find to be the ovary. To each of these organs, then, separately and briefly, we will now give our attention.

The alimentary canal commences with an attenuated, shapeless œsophagus, at the elongated end of the body, which is thus seen to be the oral extremity, and after passing upwards for about two-thirds of the length of the abdominal cavity, where it becomes enlarged and convoluted, turns back to make a single revolution, in the course of which it soon becomes diminished in calibre, and receiving the hepatic duct at this point, terminates at length in the rectum, which opens at the great papillary process. The liver consists of a single straight sacculated, beaded tube, of the same size throughout, presenting a yellow colour, and giving off the hepatic duct a little nearer one end than the other; while the tracheæ are amassed into bundles, apparently without order, and send forth many of their extremities through the two small, as well as through the large, anal apertures, to terminate on the surface of the lac in the way above mentioned.

Lastly, we come to the ovary, which consists of a voluminous tree of tubes apparently branched dichotomously, with each branch, large and small, bearing long elliptical pouches, in each of which, again, is a correspondingly shaped ovum,—the whole nearly filling the body, and terminating in a single oviduct, which opens (probably through the rectum) at the anal apertures. The ovum, on the other hand, consists of an elliptical transparent envelope filled with little cells, each of which contains oil (?)-globules and globules filled with the red colouring matter. The oil-globules are spherical, uniform in size, and much larger than the red globules, which are also spherical, but distinctly separated from the oil-globules and from each other. Whether

these bodies respectively have delicate cell-walls or not, I am ignorant; but while they are both distinctly defined in the ovum when the insect is first opened under water, both soon burst by imbibition, and become lost to view by dispersion of their contents. Thus the red colouring matter exists originally in the form of distinct globules or in cells in the ovum.

The further changes in the ovum, preparatory to the full development of embryo, I have not followed; but about the beginning of July the young ones are perfectly formed, and, issuing through the anal aperture in the incrustation they creep on to the neighbouring parts of the branch, and, soon fixing themselves by inserting their beaks into the bark as before stated, commence secreting the lac or resinous substance, in which they soon become incarcerated. Myriads issue in this way, as may well be conceived when, at a guess, I should think, each insect contained a thousand: but by far the greater number die; for although the branches become quite red with them, it is only here and there that a few, scattered or in groups, live; the rest still remain attached to the bark, but dried up and dead, which may arise, perhaps, from not having been sufficiently developed, or not being strong enough at their delivery to pierce the bark for sustenance.

On leaving the parent, the young *Coccus* is of a minium-red colour, about 1-40th of an inch long, elliptical, obtuse, anteriorly, without any division between the head and body, possessing six legs, two antennæ, two small eyes, marginal and lateral, and two long hairs, growing from the penultimate segment of the abdomen; the body segmented regularly; the oral aperture ventral and placed at some distance from the anterior extremity; two tufts of white, powdery, hair-like filament-budding from the sides of the thorax respectively, in the place of wings, and a tuft of the same kind, bifurcated, and curling outwards on each side, projecting from the anal orifice. Anal orifice surrounded by a row of short, strong hairs

At this period the insect is almost too small for examination organologically; but after it has crept off the incrustation and on to the bark of the branch, it soon becomes stationary, and enlarging, as the resinous secretion exudes from the surface of the body so as to surround all parts except the oral orifice and the three apertures from which the three white tufts issue, at the expiration of a month (that is, by the middle of August) it measures in length almost the 18th part of an inch.

If we now examine it minutely, it will be observed that the legs, antennæ, and the whole of the chitinous parts of the body have be-

come almost undistinguishably incorporated with the resinous secretion, which, when dissolved from the insect by spirits of wine, leaves the body almost in a larval or caterpillar form, but without eyes or any other appendages, save the three white tufts of hair-like filaments and the proboscis, which is now fully developed. The proboscis consists of a fleshy projection, situated at a little distance from the head, ventrally, presenting a depression in the centre, from which issue four long hairs or setæ, based internally upon as many pyramidal inflations, situated almost at right angles to each other, and supported by other horny elements, which also appear to belong to the machinery of the proboscis. These hairs together form the penetrating organ through which the juice of the tree is extracted; but whether they are hollow, and do this individually, or form a single tube by combination for this purpose, I have not been able to determine.

On the other hand, the three apertures from which the white tufts proceed, and which are now seen to open through the incrustation are observed to be situated in the thorax and at the tail respectively —thus identifying the latter, which still presents the circle of hairs round the anal orifice, with the large papilla or anal orifice of the full-grown insect, and the former or thoracic apertures with the two other papillæ, which appear to replace the wings. The white tufts projecting from all these we have already found to consist of the extremities of the tracheæ covered with a white powder.

Thus we see that the increase of size which takes place in the female insect, from its locomotive form to its ultimate development in the fixed state, is chiefly effected by an enlargement and elongation of the body between the mouth, on the one hand, and the parts from which the three white tufts project, on the other; for the oral extremity simply becomes elongated, and the three other openings of the boby remain as near together, in the resinous incrustation, at the end as they were at the commencement.

Of what the white powder on the tracheæ consists, I am ignorant, further than that it does not dissolve in spirits of wine like the lac, which, on the other hand, appears to be a secretion from the skin generally, analogous to the chitinous one which would be required under other circumstances.

*Male Insect.*

On the 8th of September I visited the Custard-apple tree again, to see how the incrusted young were progressing; and, on close examination of the parts where they were most congregated, observed, here and there, little red insects actively crawling over them, which insects

appeared so like original young ones, that I thought they must be a few stragglers of a later evolution; but on inspecting them more particularly, they were observed to possess much larger antennæ; and therefore it was concluded that they were males, which afterwards proved to be the case. Several of them were collected for description, and a small portion of one of the branches, more or less covered by the incrusted young, brought away, to show how the secretion of the lac was progressing.

The male is a little larger than the young ones at their exit from the parent; it has larger antennæ, which are hairy-plumose and consist of seven articulations, not including the two basal ones: four eyes, two lateral and two underneath the head; two long hair-like appendages, covered with white powder, proceeding from the penultimate segment above; and a beak-like horny extension from the last segment, which is curved a little downwards and composed of two members, an upper and a lower one, both grooved, and forming together a cylindrical channel, through which the semen is conveyed into the female.

Thus the changes which the larva undergoes during incarceration, to produce the male, consist in an enlargement and alteration in form of the antennæ; in the differentiation of the head, and the addition of two large eyes underneath it, which appear to be for the purpose of enabling the male, as he crawls over the lac covering the females, to find out the apertures in it that lead to the vulvæ; in the addition of the male organ, and in the replacing of the two hairs growing from the penultimate segment on either side of the tail by two delicate, white, twisted cords, composed of the attenuated extremities of the tracheæ. There are further differences between the sexes at this period, in the female having lost all traces of eyes, antennæ, and legs, whilst, no differentiation having taken place between the head and body, the female is reduced to a mere elliptical sac with but faint traces of the original segmentation. From the thorax, however, project the two tufts of white tracheæ, which are absent in the male, and also a tuft from the anal extremity, the two hairs before alluded to having disappeared altogether; but the row of hairs round the anus, which are now absent in the male, still remain in the female, and appear to serve the purpose chiefly of preventing the secretion of lac from covering up the anal aperture.

At this period only, the bodies of both male and female are about the same size (viz. about 1-27th of an inch long); but while the former has become more highly developed and eliminated, for the per-

formance of his special function, the latter has become retrograde and permanently incarcerated for hers. So unsparingly does Nature deal with her forms for the development of the new being!

*Impregnation.*—After having taken home the small portion of the branch above mentioned, which was covered more or less with the newly incrusted brood, on which there were no free males, I was astonished, on taking it up an hour or two afterwards, to observe that two had made their appearence, and were actively engaged in impregnating the females. This they do by drawing the organ before described downwards and a little forwards just over the hole in the lac which leads to the anal orifice of the female, and then inserting it; after which the male sits on the hole as it were, for a few moments, and then, withdrawing the penis, goes to another female, and so on till his office is fulfilled.

I now watched the process for some time; and having sufficiently satisfied myself of the fact as just stated, the two males were removed for microscopical examination, and the branch left as before without any. Next morning, to my astonishment, I again found two more males on it, actively engaged in performing their duty like the former ones; and then it struck me that they must come from some of the incrustations; so I examined the latter, and soon saw that there were two distinct kinds of incrustations on the bark,—one circular, slightly larger than the other, and, when *isolated* from the rest (which for the most part are agglomerated), presenting twelve notches or teeth symmetrically arranged round the base, six on each side, with the three holes above, and the white tufts projecting from them as before, described: this, of course, was the female.

The other form of incrustation was narrower and elliptical, like that of the young insect at evolution, but without serrated base, holes or white hair-like appendages. Finally, it was observed that the latter were frequently empty, and open at their unfixed and elevated end, while from others the tail of the male insect itself was projecting.

Thus the origin of the male and the process of impregnation as to time and act were easily determined; while it was also observed that in some parts there were almost, if not quite, as many male as female incrustations present, in others not so many.

On the evolution of the young, therefore, all at first would appear to attach themselves to the bark, and pierce it for nutriment—at least, all that live—preparatory to undergoing further general and generative development (for all are alike, apparently, when first hatched), and that then they respectively become changed for the fulfilment of their ulti-

mate functions,—the males for the impregnating the females, and the females for secreting the lac and developing the new brood; but the latter, as before shown, does not appear until the month of July of the following year. Thus we see that the young *Coccus*, as we have termed it, merits rather the term of "larva" (from the metamorphosis which it subsequently undergoes to pass into the matured forms of male and female respectively) than that of "young insect."

Again, all begin to secrete from their bodies the resinous substance even before they have fixed themselves to the bark; for those had it which were hatched from the lac on the branch that was first presented to me, after the latter was dry and dead; so that no doubt can exist of the lac being produced by the insect itself, and that it is not a mere exudation from the tree, which follows the insertion of its proboscis into the bark, as has been stated.

But while those which are to become males are entirely, though but temporarily, shut in by the lac which they subsequently elaborate from the juices of the tree on which they may be located, those which are to become females preserve throughout the three apertures before mentioned, from which project the white tufts of tracheæ.

These tufts, which previous to impregnation consisted of but a few filaments from each aperture, and thus in no way impeded the functions of the male, had so increased immediately after impregnation (that is, by the 20th of September), that every part of the branch covered with the new lac was rendered white by it; and although there were still a few females which were not enveloped by it (and probably, therefore, were not impregnated) yet for the most part they were thickly covered by this cottony substance; and the few remaining males that were present were so inextricably entangled in it, and so prevented from coming into contact with the females by it, that, together with the presence of dead ones also entangled in the mass, it may be inferred that this rapid evolution of the cotton-like substance at once indicates the death-season of the males, and that impregnation has been fully performed.

One other observation I would add, which is more practical than scientific, viz. that, to obtain as much resin and as much colouring matter as possible, the gathering of lac should take place towards the end of May or the beginning of June, just before the evolution of the young, which, as will have been seen above, carry away with them the greater part of the colouring matter. In Ure's 'Dictionary of Arts and Manufactures,' which contains by far the best, and least incorrect, account of this insect that I have met with, it is stated that

the evolution of the young takes place in "November or December," and afterwards, in "October or November," while the lac is gathered twice a year, in "March and October." It is also stated in the same article that the male insect has "four wings," and that there is "one to every 5,000 females;" while we are not a little surprised to see, in P. Gervais and Van Beneden's 'Zoologie Médicale' (1859), p. 374, that lac "exudes from certain trees through the punctures which have been made by the females."

It was this and sundry other statements, together with seeing that the insect could be examined successfully only in the country where it lives, which induced me to avail myself of the opportunities presented to me of obtaining as much of its history as I could, for publication.

On the 25th of *June* I received the branch of the Custard-apple tree with the living matured lac-insect on it in its incrustation. About the 5th of *July*, the young or larvæ, about 1-40th of an inch long, began to issue. On the 14th of *August* all were fixed to, and progressively enlarging, in incrustation, on the Custard-apple tree. On the 8th of *September* the males were leaving their incrustations and impregnating the females. each sex being now about 1.27th inch long; and on the 20th of *September* the females were almost all concealed under an exuberant evolution of the white cottony substance (which we now know to be the attenuated extremities of the tracheæ covered with a white powder), with a single male insect here and there alive, and many dead ones, entangled in it.—(*Annals and Mag. of Nat. History January* 1851.)

BOMBAY, *Oct.* 11, 1860.

---

## SOME REMARKS UPON SHELLAC, WITH AN ESPECIAL REFERENCE TO ITS PRESENT COMMERCIAL POSITION.

We have now and then rapid and unexpected changes in the drug market. At times there are certain premonitory symptoms of such changes, of which those resident in Liverpool and London, and even some at a distance, not unfrequently take advantage. Immediate purchases are made, or contracts for forward delivery entered into, which very often result in large gains to the successful buyer. Or, again, there have been instances of a millionaire stepping to the in market and purchasing all that could be had of a certain article, holding the same, and only selling at an advanced price. Such instances are comparatively rare, because there is in all transactions of this kind, not only an almost unlimited command of capital required, but

such a course is necessarily accompanied by considerable risk. A very successful and notable instance of such a case occured some years ago, when a well-known banking firm bought up all the *mercury* that could be got, either at home or abroad, stored it up, and held until the price advanced so considerably, as to yield a very large and handsome profit, at the expence, of course, of those who were in the habit of using this valuable metal in medicine or in arts. More recently a house abroad gathered together all the fine Vanilla pods which could be obtained, and in like manner kept this market so bare, that most extravagant prices were paid for the article. So thoroughly was this game played, that at times large tins of Vanilla were consigned to certain parties in London, and if these individuals failed in realizing an increased price, their instructions were quite definite—to return the whole to Paris, there to be stored up, or sold at a limit previously determined upon. At other times a *real scarcity* may be cited as the cause of an advance, and this frequently owing to circumstances over which no one can exercise any control; such as ungenial and unfavourable weather during the season of vegetation, of which we have at the present time very good examples in the scarcity and consequent high brice of belladona, peppermint, and lavender, or in the cream of tartar market, where the continued high price is owing to the effects of the oidium or vine disease interfering with the production of wine, and thus reducing the quantity of deposit from which this article is procured. But to go still further from home, and to come more especially to speak of the article it is my intention very shortly to introduce to your notice, I may at once refer to the extraordinary position which shellac holds at the present time in the commercial world. This substance is known to us all, for although not used in medicine, it is extensively employed in the arts. Thus, it is the principal ingredient in our finer kinds of sealing-wax, while in that very important manufacture, hat-making, it is not only largely employed, but no substitute can be found For wood-polish it is a necessary ingredient, and our pianos and other piecies of beautifully polished furniture, would be less pleasing to the eye were we deprived of shellac. In varnishes used by the upholsterer and others, its presence cannot be dispensed with: while the dye, which forms an integral part of this gum resin, is so much used by the woolen manufacturer, that even the gay clothing of our soldiers would be dull and dim without the aid of the permanent and beautiful lac dye.

Before speaking of its commercial relations, it may not be uninteresting to refer more particularly to the manner and places of production.

Our supplies are obtained chiefly from the East Indies, the districts most noted being Assam, Pegu, Bengal, and Malabar, and along the course of the Ganges.

The shipments are, however, made principally from Calcutta. In the districts above named there are two or three very large establishments at which they employ more than a thousand hands. Besides these factories, there are numerous makers on the small scale. A feeling of secrecy pervades the establishments, and strangers are refused admittance. On the twigs of certain trees, known as the ***Ficus religiosa, Ficus indica, Rhamnus jujuba, Croton lacciferum,*** and the ***Butea frondosa,*** found in the jungles and forests of India, a small insect called the *Coccus ficus* fixes, and there deposits a certain quantity of a dark coloured resinous matter. This, on careful examination, has been found to be the stomachs of those insects left there after death as food for their larvæ, the outer or specially resin coating being intended for the shelter and protection of the young. It is about the months of November or December that the brood make their escape from their previously protected habitations, and fasten themselves in their turn upon the small branches. As these increase (which they do very rapidly) the twigs or stems become completely covered, and at a particular season of the year are collected, placed in sacks, and carried to the manufactory. These encrusted twigs are first ground in a mill to rough powder, and then carried away to what is called the dye work of the establishment. Here troughs are ready for their reception, and after being immersed in water, the natives commence and tread upon the material, so as to remove the dye from the resin, &c., and as this colouring matter is soluble, it is in a short time taken up by the water, run off into other suitable vessels, fresh water added, and the process continued, with the addition of fresh quantities of water, until the whole is completely exhausted. The remains are then collected, the woody fibre, &c., got quit of and the little particles which remain freed almost entirely from colour, called and recognized in our market as Seed Lac. The different waters which have thus taken up in solution the colouring matter of the stick lac, is run into cisterns or vats, where the deposition in course of time takes place, and then the powder in the form of paste is partially dried, put into square cases, stamped, and thoroughly dried, forming the regular lac dye of commerce. It is sent home to this country in those square blocks, and reduced to powder for the purpose of trade. I may as well dismiss this part of my subject by stating, that this dye is used very largely and very extensively in dyeing woollen goods. Struck with a

perchloride of tin, it becomes a fine and very beautiful scarlet. This preparation is well known, being made by boiling tin in hydrochloric and nitric acids, and from its general use for the above purpose has commercially received the name of *Lac Spirits*.

The great commercial importance of this article may be better understood when I mention, that from Calcutta alone the annual export is supposed to be very nearly four millions of pounds' weight.

The different kinds of shellac may be named as follows:—

| | |
|---|---|
| Stick Lac. | Seed Lac. |
| Shell Lac, | Lump Lac. |
| Button Lac. | White Lac. |

Various shades of some of the above receive the names of garnet, liver, and orange. These are dependent upon the quantity of natural lac dye left in the seed lac before it is prepared, as will be immediately noticed. The five kinds first enumerated are imported; the last is prepared in this country.

Stick and seed lac require little notice The former is the natural production of the insect already described, and the latter is the remains after the extraction of the colouring matter to form the lac dye. The small granular pieces of gum resin left are collected as free from extraneous matter as possible, and dried in the sun. Button and shell lac are the two descriptions most employed in this country, and are both prepared from the seed lac as follows:—The grains are placed in long sausage-shaped bags and heated before fires, until the liquid resin exuding slowly through the interstices of the cloth is scraped off and immediately transferred to the highly polished surface of earthenware cylinders, heated by being filled with hot water. The melted lac is spread over these cylinders by men, women, or boys, who use for this purpose a palm leaf, and thus produce cakes about twenty inches square. It is then, when cool, thrown into chests, and by the transit becomes much broken ere it arrives in this country. The finest bright orange shellac is believed to be coloured artificially, and I think correctly—having had occasion more than once to reject samples from their peculiar light yellow shade. Orpiment is thought to be the colouring matter employed.

Button, block, garnet, and liver lac, are all produced more or less carefully from different qualities of seed lac, the colour and appearance depending entirely upon the districts from whence the seed lac has been obtained, and the completeness of the removal of the lac dye. Nothing more need be added as to the preparation of these lacs—and, indeed, I believe no further particulars are known. White lac is pre-

pared in this country from ordinary shellac, by being first boiled in a solution of carbonate of potash, through which a stream of chlorine is then to be passed. Hydrochloric acid is added, and last of all red lead. The white pulpy mass is then collected, washed and pulled into sticks of different lengths. This description of lac is not much employed, being chiefly consumed in manufacturing the different light shades of fancy sealing-wax. Before proceeding to the closing part of these remarks—viz. the present commercial relations of this article—it may be stated that good shellac should contain from 84 to 90 per cent of resin alone, with varying quantities of colouring matter. When not carefully prepared, a quantity of sand is often present, which deteriorates the lac, and depreciates its value when used for varnishes, &c.

For about two years there has been a steady, but most unaccountable, rise in the price of all description of lac. Thus, in October. 1858, the price in the London market, as well as in Liverpool, was 82*s*. per cwt. During the same month in 1859 it reached 123*s*. per cwt; and in October, 1860, sold in the same markets at 260*s*. per cwt., while in both the enormous price of £14 has, within the last fortnight been obtained. At first sight one is very apt to consider such extreme prices the result of speculation, but I have ascertained the last quotation from Calcutta, I mean in the market there, to be 57 rupees per maund. There are, I understand, 3 maunds to every 2 cwt., or a maund and a half to each 112 lbs.: so, allowing each rupee to be worth 2*s* of British currency, we have the cost in India before shipment as £8 11*s*. The estimated expence of freight, &c., may be roughly stated, as £2. which brings up the price on landing to £10 11*s*. This appears a very good margin for the importers. But it is said on pretty good authority that there are not at present fifty chests of really good, fine, orange shellac to be got in London. If this be correct, then the difference given above, between the net value as imported and the price realized here is not to be wondered at, nor can it be called excessive. It might, however, very naturally be asked, what is really the cause of such high prices and such scarcity? The most feasible reason, and I believe the true one, is, that the native forests where lac has hitherto been found in such abundance, have suffered so dreadfully from the ravages and devastation of war, that the native collectors have failed entirely in obtaining supplies of the raw meterial. Now this is highly probable, for we know that some of the largest lac factories are on the banks of the Ganges; but then in more peaceful

districts this reason cannot be considered tenable. I am somewhat inclined to suppose that there is really a natural scarcity in the jungle of the little lac-producing insect, and that these two causes, operating together, have brought about the present state of matters, One very incomprehensible thing is, that the prices of lac dye have not risen, and that there is a plentiful supply of this article in the market. This, of course, can only be accounted for in two ways—either, that the supply meets the demand, or that very large quantities have been stored up before the scarcity of lac began.

The quantity of all kinds of gum lac exported from Calcutta annually about eight years ago was supposed to be about 1800 tons, while, in 1858, it fell to about 700 tons, in 1859 about a fourth less, while during the present year the quantity has considerably increased. But in November, 1858, the stocks on hand in London and Liverpool were 3959 chests and bags; same month in 1859, 1316, and in November, 1860 (last month), 1345. Of these I cannot tell the relative proportions of orange, garnet, or livery. Of course, all descriptions are included. There are vessels, however, now afloat and expected to reach England in due course, having on board no less than 3192 chests and 263 bags of shellac, which, doubtless, if they do not sink to the bottom of the sea, ought to raise our home stocks, and tend to reduce prices; but we are told, on the other hand, that there is a large demand for the American and foreign market, while all our drug and other merchants at home are so bare of stock, that they will be ready to buy whenever the price moderates.

I dare say it must have occurred to more than one to inquire why, with such extravagant prices, some other substance or compound has never been thought of and introduced instead of shellac. This has been done, but most unsuccessfully. When in London, about eight months ago, I was shown an article which a company just established were about to make and sell instead of shellac. The price was £3 per cwt. cheaper, and those about to engage in its manufacture were sanguine as to the ultimate results. I was told, whenever it was ready to send out in quantity, a sample would be sent. Accordingly, about a month afterwards, a parcel arrived, regarding which my opinion was requested. After carefully trying the article, I gave a report condemnatory of its use in any of the arts or manufactures in which the regular lac had hitherto been used. Although I was little thanked for this opinion at the time, I do not think the stuff I now show continued long to be made. Indeed, it really appears to be little else than a

mixture of shellac and some aloetic resin, very probably Cape aloes. Be that as it may, I am satisfied from experiment that it could never come into competition with even inferior kinds of shellac.

In closing these few remarks, I may be allowed to express a hope, that lac has seen its highest price, and that during 1861 it will be considerably reduced. I am very unwilling to believe, that native supplies have really become extinct; while the enormous comparative prices still existing, cannot but tend to increase that activity and energy in searching for fresh supplies, which will, I trust, result in sending more raw material to the native lac manufactories, and thus by increasing stocks at home, gradually reduce the market price to something more moderate, and approximating the steady prices at which shellac has until lately stood on the price list —*(Mr. Mackay, in Pharmaceutical Journal, Jan.* 1861.*)*

———

# Monthly Proceedings of the Society.

*(Wednesday, the 12th September, 1860.)*

C. A. Cantor, Esq., Vice-President, in the chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected Members:—

Colonel P. Abbott, Dr. B. Hooke, the Maharajah Jung Bahadoor, G. C. B., Messrs. T. F. Peppe, C. Swaine, M. E. Durup de Dombal, Lieutenant F. T. Pollok, Messrs. W. Fitzpatrick, J. G. C. Herklots, G. Schilling, Colonel S. A. Abbott, Captain F. L. Mackeson, Captain F. Alexander, Messrs. Arthur Pigou, C. S., Elphinstone Jackson, C. S., J. E. S. Lillie, C. S., Dr. A. J. R. Sheridan, Lieut.-Colonel W. H. Seymour, C. B., Captain C. H. Palliser, the Hon'ble Sir Bartle Frere, K. C. B., and Captain A. Allen.

The names of the following gentlemen were submitted as candidates for election:—

Dr. Alexander Garden, Civil Assistant Surgeon, Ghazeepore,—proposed by Mr. H. C. Hamilton, seconded by the Secretary.

E. H. Whinfield, Esq., C. S., Gya,—proposed by Mr. E. F. Lautour, seconded by Dr. Thomson.

H. Andrew, Esq., Civil Engineer, Dinapore,—proposed by Mr. Robert King, seconded by Dr. J. Sutherland.

Captain R. H. Tulloh, Executive Engineer, Azimghur,—proposed by Mr. C. F. Wintle, seconded by the Secretary.

---

A report was read from a Section of the Cotton Committee (Messrs. Hurst and Cantor) on sundry musters of cotton raised from foreign seed in the Dhacasee District (Hyderabad Assigned Districts). These musters were submitted at the July meeting. Ordered, that a copy of this report be furnished to the Government of India, in reply to their communication.

Letters were also submitted.

1.—From R. Fortune, Esq., London, dated 18th July, announcing his approaching departure for China and Japan, and offering his assistance to the Society in obtaining plants and seeds from those countries.

The Secretary mentioned that he had sent Mr. Fortune a list of *desiderata* by the last mail.

2.—From Captain G. F. Vincent, Honkong, a second application for seeds, &c., for Soldiers' gardens. The Secretary stated that one supply had already been sent to Captain Vincent, and another would be sent by the first opportunity, as directed by the Council.

3.—From Colonel F. C. Burnett, Jullundur, reporting must favourably of the French madder raised from seed supplied last year by the Society. "It has not suffered the least from the unusual heat, and is now going on flowering and seeding at the same time. I have already collected about a seer of seed. Although it thrives so well here, I have no doubt it will do even better in the lower hills in the Kangra valley, where I have purchased some fine land which I intend chiefly for tea, but I will also keep a certain portion of it for experimenting on many articles of produce, and I am certain madder will succeed, as I find several plants of the same species growing wild in the hills. I think it would be desirable to introduce the Cork Oak in the hills My land is covered with evergreen oaks; I have plenty of mulberry plant grown from English seed, and Malaga vines growing well also from seed; the *Euclalyptus piperita* from Gibralter grows well here, and is very ornamental; plums, apricots, and peaches grow well in the Kangra valley, and do not degenerate; also the cherry, ginger, and turmeric grow well, but rice is the prevailing hot weather crop, and there is not finer rice than the Kangra rice. I am sure that flax and hemp would also do well."

4.—From R. W. Bingham, Esq., Chynpore, also respecting the madder plant. "My madder plants, grown from the French seed you sent me, are coming on nicely, and are now going to seed. I had three beds sown, but two beds died off: the third bed is, however, all right, and I dare say will give me more than enough seed to replace the other two. The seed will be acclimated and therefore more useful, and next season I hope to have a good quantity."

5.—From Henry Leeds, Esq., Deputy Superintendent of Forests in Burmah, forwarding, as requested, a quantity of Teak seed. The Secretary mentioned that he had sent a portion of this seed to the Governor of Labuan, who was anxious to endeavour to introduce this valuable tree in Borneo. The remainder is available to members.

6.—From the Secretary Horticultural Society of Victoria, Melbourne, intimating the establishment of an experimental garden in connection with

their Society, and wishing to commence a correspondence and exchange of seeds, plants, and publications with this Society. Agreed to.

7.—From the Secretary Literary and Philosophical Society of Manchester, requesting an interchange of publications. Agreed to.

8.—From Messrs. James Carter and Co., London, advising despatch of the Society's annual consignment of flower seeds.

9.—From Dr. Thomson, a list of timbers at the Port Blair Settlement, recognized by the Burmese as common to Burmah, with remarks on quality, &c.

10.—From Captain W. H. Lowther, St. Denis, dated 23rd June, some additional remarks respecting the Flora and Horticultural products of the Isle of Bourbon. This interesting paper, as also the previous one, were ordered for publication in the number of the *Journal* now in the press.

---

(*Wednesday, the 10th October,* 1860.)

C. A. Cantor, Esq., Vice-President, in the chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected members:—

Dr. Alexander Garden, Captain R. H. Tulloh, Messrs. E. H. Whinfield, C. S., and H. Andrew, C. E.

The names of the following gentlemen were submitted as candidates for election:—

Captain C. M. Fitzgerald, Deputy Commissary General,—proposed by Mr. H. E. Braddon, seconded by Mr. R. Blechynden.

J. W. Garstin, Esq., Deputy Magistrate, Buxar,—proposed by General E. Garstin, seconded by the Secretary.

Captain E. Chamier, Deputy Commissioner, Nawabgunge, Oude,—proposed by Lieutenant Malcolm G. Clerk, seconded by Mr. Cantor.

Captain T. Dennehy, Commanding Allahabad Divisional Military Police Battalion,—proposed by Captain Charles Drury, seconded by the Secretary.

George Williamson, Esq., junior, Jorehaut, Upper Assam,—proposed by Mr. T. E. Carter, seconded by Mr. Cantor.

Captain Forsyth, second in command, First Regiment Assam Light Infantry,—proposed by Mr. T. E. Carter, seconded by Mr. Cantor.

The Rev. Malcolm S. Laing, Chaplain of Futtyghur,—proposed by Mr. T. J. Kenny, seconded by the Secretary.

G. N. Wyatt, Esq., Peeprah, Mootecharee,—proposed by Mr. Cantor, seconded by Mr. T. M. Robinson.

Captain H. R. Drew, Commandant Kamroop Regiment, Furreedpore,—proposed by Mr. H. G. French, seconded by Mr. S. P. Griffiths.

T. M. Gibbon, Esq., Turcooleah Factory, Tirhoot,—proposed by Mr. T. F. Peppe, seconded by the Secretary.

R. H. Smith, Esq., Principal Sudder Ameen, Benares,—proposed by Captain J. Cockerell, seconded by Mr. Cantor.

J. C. Johnson, Esq., Indigo Planter, Purneah,—proposed by the Secretary, seconded by Mr. W. G. Rose.

Henry Burrows, Esq., Railway Contractor,—proposed by Dr. Mouat, seconded by the Secretary.

The following contributions were announced :—

1.—Report on the Government Botanical and Horticultural Gardens, Ootacamund, for 1858-59. Presented by Dr. Cleghorn.

2.—Journal of the Royal Asiatic Society of Great Britain and Ireland, Vol. XVII., Part 1. Presented by the Society.

3.—Reports of the Committee of the Bengal Chamber of Commerce, from June 1858 to April 1860. Presented by the Chamber.

4.—Memoirs of the Geological Survey of India, Vol. II., Part 2. Presented by Professor Oldham.

5.—A few barrels of Guano. Presented by the Chamber of Commerce.

6.—A few Mangosteen seedlings. Presented by C. B. Wood, Esq.

7.—Seeds of a black Chilly from Upper Ava. Presented by Colonel Fytche.

8.—Potatoes from England, onions from Arabia, and cocoanuts from the Maldives and Ceylon. Presented by Mr. H. J. Butler.

9.—A specimen of Hops grown at Kousanuee, in Kumaon. Presented by K. McIvor, Esq.

*Nursery Garden.*

A note was read from the Gardener, submitting a new variegated hybrid *Begonia*, which he has succeeded in raising at the Society's Garden : a hybrid between B. *argyrostigma* and B. *Malabarica*, the former as the male and the latter as the female parent. "You will easily perceive," observes Mr. McMeolm, "that it is a new and distinct variety, being all regularly covered over

with numerous small silver dots, which gives it an interesting appearance. It has not yet flowered, but there is reason to believe from its parentage that the blossom will form an additional attraction. This is the only instance of a hybrid *Begonia* being raised in Bengal that I know of, and I think it not too much to say that it is the finest, and will become the greatest favorite. It is the best of its class that I know of; that stamp in England is only represented by B *argyrostigma* and B *punctata,* consequently the plant in question is a *ne plus ultra.* It is a novel and distinct hybrid. *Habit,* strong, robust, upright;—form, elegant. *Foliage,* beautifully marked with distinct pitted silver dots on a dark ground. On the development of the young leaves they present a beautiful rose coloured appearance.

"I am also glad to inform you that 200 plants of the new and beautiful Acanthaceous plant *Meyenia erecta alba,* are ready for distribution to members of the Society. These 200 plants are the produce of a small plant presented to the Society ten months ago by Dr. Thomson, Botanic Garden.

"This is a plant I know will recommend itself to all who see it. I believe it will become a handsome, hardy, free-flowering under-shrub, well adapted for pot culture or border decoration.

"In England it is found among the list of favorites, and is largely cultivated as a stove plant, but it is much better adapted for this climate than that country.

"There is another variety of this beautiful genus which bears a blue flower. That too we possess and are increasing in great numbers, and will be ready to send out strong plants in a few weeks; both apparently are well adapted for this country."

A tabular statement of the germination of seeds of field crops recently received from Messrs. James Carter and Co., of London, was also submitted by the Gardener. The result is very satisfactory. Some kinds have germinated 100 to 90 per cent., others 89 to 80; the general average being 70 per cent.; not one kind has failed to germinate. The Secretary reported that the demand this season for these seeds had been greater than in previous years: about fifty members in different parts of the country had been supplied up to the present time.

---

*Hemp and Flax from Kumaon.*

A Report was read from a section of the Fibre Committee, (Messrs. Stalkartt, S. H. Robinson, and C. Weskins,) on the samples of hemp and flax raised in Kumaon, and submitted at the August Meeting by

Mr. P. Carnegy. *Ordered,* that a copy of this Report, which is altogether favourable, be forwarded for Mr. Carnegy's information.

---

### *Transmission of Cotton-cleaning Machines, Seed, and Medals from the Manchester Cotton Supply Association.*

Read the following communication from the Secretary Cotton Supply Association at Manchester, dated 1st September 1860:—

"I am in receipt of your favour dated 18th July 1860, advising the despatch of B-L. for seven bales of cotton per "Florence Nightingale." By this mail I forward to Messrs. Morsley and Hurst, Calcutta, a valuation of four samples of cotton received through them, for which the Agricultural and Horticultural Society awarded prizes. On the arrival of the seven bales, the Committee will take care that due publicity shall be given to ensure the fair sale of this cotton, and the proceeds shall be placed to your credit. I am desired to express on behalf of the Association the high estimation in which the labours of your Society, sustained by so great liberality, are held here. They have requested me to forward to Messrs. Morsley and Hurst, Calcutta, two Gold Medals and six Silver Medals to be placed at the disposal of your Society as prizes for successful cotton cultivation, in the hope that they may prove useful in conjunction with the efforts of your Society.

"A considerable supply of seed (New Orleans) is about to be shipped to Messrs. Morsley and Hurst, some portion of which your Society may be enabled to turn to useful account.

"Your previous favours on the subject of cotton gins have been duly received, and I was under the full conviction that your enquiries as to the six saw gins had been replied to. On enquiry I find that you have not been answered on this head. We have however shipped a number of small hand gins to Calcutta some time since, to the Chamber of Commerce: five of Dunlop's (£3 each) and five of Wanklyn's (30*s.* each). We have also just shipped twenty of Wanklyn's, and a case of six ploughs, to Messrs. Morsley and Hurst, who will hold a portion of them at your disposal. We are also about to forward a few more of Dunlop's, to the same address. In one of your letters you speak of the Saw Gin, in another you describe it as Dunlop's Macarthy Churka. The Saw Gin has never been sent out or recognized by this Association, as it is found so far to injure the cotton as to depreciate its value from ½*d.* to 1*d.* per lb. The Wanklyn as well as the Dunlop Gins are constructed on the principle of a roller with oscillating blade. The roller drawing the fibre between two blades or knives, one of which is stationary in front of the

roller, the other oscillating rapidly before the other to liberate the seed from the cotton. This machine is used in America, and now very extensively in Egypt. The small gins we have sent to Calcutta are on the same principle but adapted for hand use. They have proved of great service in many parts of the world.

"We expect shortly to hold a Meeting to test the merits of a new Gin by Dr. Forbes, the Government Superintendent of the Cotton Factory in Dharwar. This gin is nothing more or less than the Indian *churka*. Two rollers 10 inches wide moving in contrary directions are set in motion by a treddle. The upper roller is made of iron about ¾ inch in diameter, the lower roller is perhaps 2 inches in diameter. In this treddle *churka* there appears to be great merit. We have tried it at these rooms, and it appears to act well, doing a large amount of work, well, and in a short time. Dr. Forbes, now in this country, is preparing it for trial. He has also adapted this *churka*, so as to be driven by power, cattle, water, or steam. So soon as the results of the trial are published, I will forward you copies of the Report. We hope in the course of two months to forward a supply of Sea Island seed to our Honourary Agents at Calcutta, and shall presently forward to them from Egypt direct a supply of Egyptian seed.

"A Cotton *Buying* Company will in all probability be formed here in the course of the next few weeks, which may perform essential service in India in such cases as those referred to in Mr. Berkeley's letter. See No. 49, *Cotton Supply Reporter*. Acknowledging the receipt of your several published Reports, for which accept out best thanks,

I am, &c.,

G. R. HAYWOOD,

*Secretary, C. S. A.*"

*Valuations of Cotton Samples received from Messrs. Morsley, Hurst, & Co.*

| *Our No.* | | *Value.* |
|---|---|---|
| 41. | Delhi No. 1, colour good, clean, very fair staple, equal to middling Orleans - - - - | 6¼ to 6½*d.* |
| 42. | Delhi No. 2, colour bright, staple short and tender, very tender - - - - | 5*d.* |
| 43. | Bourbon Cotton, colour rather yellow, staple very long, even, and strong - - - - | 7½ to 8*d.* |
| 44. | Oopum Cotton, colour very fair, staple short as moss, value nominal, probably - - - | 5*d.* |

The Secretary desired to correct an error of Mr. Haywood in the third

paragraph of the above letter. His first communication on the subject had reference to the possibility of obtaining a few sets of the "Cottage Saw Gin" manufactured some years ago at Manchester, of which the Society possessed a working model, and for which there had recently been a demand. In a subsequent letter he had asked for information respecting Dunlop's *and* Macarthy's *churkas,* with the view of obtaining a few sets for distribution if found to possess the merits ascribed to them.

*Resolved,* that the best thanks of the Society be tendered to the Manchester Cotton Supply Association, and that lists be opened for registry of the names of cultivators wishing to have sets of the above mentioned machines, and to grow the particular kinds of seed referred to.

---

*Report of Mission to South America for the collection of Quinine-yielding Cinchonas.*

Read a letter from the Under-Secretary, Government of India, transmitting for the information of the Society the following Report of Mr. Markham's proceedings while engaged in South America in collecting plants of the Quinine-yielding Cinchona trees:—

*Letter from C. R. Markham, Esq., to the Under-Secretary of State for India.*

British Consulate, Port of Islay, Peru,
June 9th, 1860.

SIR,—I HAVE the honour to report for the information of the Secretary of State for India in Council, that, in performance of the service on which I am employed, I have arrived at this port with 529 of the more valuable species of Cinchona plants, which are now in course of establishment in the Wardian cases, for conveyance to India.

2. I propose, in this Report, to give a detailed account of my proceedings from the time of my departure from the city of Arequipa, (whence I addressed my last letter (No. 3) to Mr. Bourdillon,) to my arrival with the plants at this port. Some of my observations in the Cinchona region may prove useful to the gentlemen who will have charge of the cultivation in India, and should it be considered advisable to supply them with printed copies of this Report, they should be in their hands one or two mails before the arrival of the plants.

JOURNEY ACROSS THE CORDILLERAS OF THE ANDES.

3. On March 22nd, 1860, I left Arequipa, accompanied by John Weir, the gardener, and arrived at the city of Puno, on the banks of Lake Titicaca, on

the 27th, a very painful journey, over snowy heights 15,500 feet above the level of the sea, in the worst season of the year, the rigours of which were increased by the debility brought on by an illness from which I had suffered at Arequipa, and by the *sorochi* or violent headaches and sickness, occasioned by the great elevation of this region above the sea. The loftiest part of the road is several hundred feet above Mont Blanc.

4. At Puno I was occupied for some days in collecting information, which induced me to alter the plans for executing this service that I had previously formed at Arequipa. I found that a war with Bolivia was imminent; that the state of that country, owing to the excessive rains, would render travelling exceedingly slow; and that the extreme jealousy of the Government and people, for preserving their present monopoly of the bark trade, would render it impossible for me to make a collection personally. I have a most complete distrust of all native agency; I therefore abandoned my intention of going into Bolivia, and it was very fortunate that I did so, for a decree has since been issued by Dr. Linares, the President of that Republic, prohibiting all communication between Peru and Bolivia, and the passage of either traveller or goods across the frontier, this being, of course, the forerunner of war between the two countries.

5. There is no question that the Calisaya tree, the most valuable species of Cinchona, is found in greatest abundance in Bolivia; but, though scarcer and more difficult to collect, it is also to be met within the Peruvian province of Caravaya. I finally resolved to proceed without delay to the cinchona forests of Caravaya, to make as large a collection as possible myself, without employing any native agent.

6. On the 7th of April I left Puno, and commenced my journey to Caravaya, travelling without a muleteer, and with the cheapest beasts hired from one village to another, a way which entailed much trouble and annoyance, but which I adopted as being far more economical. There were four broad and very rapid rivers to cross on *balsas* or long bundles of reed stitched together, while the mules swam. The plains and mountain ranges over which the way passed averaged a height of 12,000 to 13,000 feet above the level of the sea, and one snowy pass attained a height of nearly 17,000 feet. The season was one of violent storms, with hail and snow and constant rains. The road passed through the towns of Lampa, Pucara, and Azangaro to Crucero, the capital of the province of Caravaya, which I reached on the 16th of April, a distance of 160 miles from Puno.

7. Crucero is a mere collection of mud huts, built on a very elevated swampy plain, just on the western side of the snowy Caravaya range, whence roads branch off over the passes to the forest-covered valleys on the eastern slopes.

THE PROVINCE OF CARAVAYA.

8. The Peruvian Province of Caravaya, in the Department of Puno, consists of a snowy range of mountains extending for 180 miles from the Department of Cuzco to the frontier of Bolivia, from the eastern slopes of which long spurs run out to the north and east, until they gradually subside into the vast forest-covered plains which extend for thousands of miles to the shores of the Atlantic. These spurs or ridges enclose valleys, the sides of which are generally covered with dense forest, while the summits of the ridges are clothed with rich pasture land, interspersed with small thickets in the ravines and gullies. These higher regions are called *pajonales.* The numerous streams and rivers which flow down the valleys of Caravaya, and which have long been famous for their gold washings, finally unite in the plains to form the river Ynambari, a tributary of the still unknown Purus, which is probably the largest secondary river in the world.

9. The most important of the Caravaya valleys, and that which I determined to examine first, is that of Sandia, which contains a population of 7,000 Indians, and annually yields 90,000 lbs. of cocoa, and 10,000 lbs. of most excellent coffee.

10. On April 18th I left Crucero, and crossing a lofty snow-covered ridge, commenced the descent from an arctic to a tropical climate, down the beautiful ravine of Sandia. The pass above Crucero is 13,600 feet, and the village of Sandia 6,667 feet above the sea, being a descent of 6,933 feet in 30 miles. Arriving at Sandia on the 20th, I began at once to collect provisions and make other necessary preparation for a further advance into the interior, intending first to examine the *pajonales* of the Sandia valley in search of the *B Josephiana* variety of the calisaya plant, which Dr. Weddell had informed me was to be met with in those localities, and then to cross a mountain ridge into the forests of Tambopata, where the tree calisaya and other valuable species of cinchonæ were said to abound.

*Cinchona Calisaya, var. B Josephiana.*

11. On the 24th of April I left Sandia, accompanied by the gardener, a native lad, and three Indians bearing a tent, provisions consisting of toasted stale bread, salted cheese, maize, and a few other necessaries, and proceeded

down the valley, following the course of the river. The foaming torrent dashed through the centre of the valley, and the masses of verdure on either side were toned down by many flowers in large patches, purple melastomaceæ, orange cassiæ, and scarlet salviæ. At a distance of fifteen miles below Sandia, the perpendicular cliffs rise up from the river on either side to a stupendous height, and the path winds up in zigzags, to creep along the edge of steep grassy slopes or *pajonales*, far above the tropical vegetation of the ravine.

12. It was at this spot that the *Calisaya (var B Josephiana)* was first met with,—a number of young plants growing by the road side, and older shrubs lower down the slope, with their exquisite roseate flowers and rich green leaves with crimson veins.

13. The rock appeared to be a hard schist, much discoloured with red oxide, quartz occurring here and there; the soil a stiff brown loam, with a little vegetable mould. A little above the road there was a small thicket of arbutus and purple melastomaceæ in a shallow gully, surrounded by the long-bladed grass of the pajonal (*stipa ychu*). Here there was a *Cinchona Caravayensis* and another *Calisaya Josephiana*. The height of this spot above the sea was 5,422 feet, and the plants growing round the cinchonæ were purple melastomaceæ, arbutus, and blechnum and trichomanes ferns. The positions of a number of young plants, to be collected on our return, were noted down.

14. The scenery of this part of the valley is remarkably beautiful. Lofty mountains, with their cascades, rise up on either side, their summits crowned with rich grass, their gullies full of trees and flowers. Half way up, in many directions, terraces of coca rise, tier above tier, fringed with ferns and begonias. We have the shrub cinchonæ on the high *pajonales*, perhaps the finest coffee in the world in the ravine, and a little *gilium*, also of the cinchonal alliance, by the road sides.

15. On the 26th I travelled for a considerable distance along the skirts of mountains at a great height in the region of *pajonales*. No ravines or large cascades cut up the face of the mountains, all was exposed to the full glare of the sun, and though there was a profusion of melastomaceæ in the shallow gullies, there were no cinchonæ. The latter evidently dislike very exposed situations, at these heights.

16. On this day also I left the valley of Sandia, and, crossing a mountain range, went down from the grassy uplands to the banks of another river, the Huari-huari, flowing through a tropical forest full of palms and tree

ferns. On the verge of the *pajonal* there were a number of *Calisayas* (*B. Josephianæ*), which were also marked down, to be collected on our return.

17. From the banks of the Huari-huari, a very dangerous and tedious ascent led to the ridge which divides the valley of Sandia from that of Tambopata. The ridge consists of grassy slopes, with dense thickets of melastomaceæ, palms, tree ferns, bamboos, incense trees, and cinchonæ in all the small ravines and gullies. The useless *Chinchona Caravayensis*, with its large red capsules and coarse leaves, was common enough, but the *Calisaya Josephiana* very rare. One calisaya, whether it be the variety *a* or *B* of Weddell, was met with on this pajonal, 18 feet 6 inches in height, and 8½ inches in girth, two feet above the ground; yet Dr. Weddell gives the height of the *C. Josephiana* as varying from 6½ to 10 feet.

18. I cannot but conclude that the *Josephianas* are not even a variety of the true calisaya, but exactly the same plants, stunted to the size of shrubs from their elevated or exposed situations. I have traced these calisayas from the shrub to the tree, without finding any difference in the flower or fruit to warrant even a variety. While still in the region of *pajonales*, I found four or five trees, 20 to 30 feet high, with flowers and fruit of Weddell's *Calisaya, vara. Vera.*

19. I had but slight opportunities of observing the temperatures of the *pajonal* region about 5,000 feet above the sea, where the *C. Josephiana* is found. On April 25th to 27th the thermometer ranged, between 7 A. M. and 9 P.M., highest 67°, lowest, at night, 56°; and on May 12th to 14th from 69° to 53°. The shrub calisayas were growing on the edges of the thickets, and not in deep shade.

20. The most common plants growing with the shrub calisayas were the melastomaceæ with purple flowers, and the *huaturu bajo*, or incense trees.

21. In returning from the forests, on May 13th and 14th, twenty plants of the shrub calisaya were collected in the Huari-huari ravine, and fifty-five on the pajonal where they were first seen, called *Paccay-samana*, most of them very promising young seedlings. Total 75.

### *Cinchona Calisaya, var. a Vera.*

22. Having crossed the ridge of pajonales, I entered another of the Caravaya valleys through which the river Tambopata flows, which rises in the mountains separating Peru from Bolivia. The Tambopata valley was visited

by Dr. Weddell in 1847, and its forests were said to abound in cinchonæ. In the upper part of the valley I found a small clearing made by one Juan de la Cruz Gironda, who was obliging, and willing to assist me, and I procured an excellent guide named Martinez, a native of the place, who was well acquainted with the forests.

23. With the exception of a few small clearings, the whole ravine is covered with one dense tropical forest, without road or path of any kind, and I resolved to penetrate, in the performance of this service, where, as far as I could learn, no European had been before, and no human being for upwards of twelve years, when the bark trade of Caravaya came to an end. I knew the risks would be great, but that they would be fully justified by the importance of the object to be attained, and on the 1st May I left Gironda's clearing, accompanied by the guide Martinez, the gardener, and four Indians carrying a tent and provisions.

24. Beyond the river Challuma, a tributary of the Tambopata, and the extreme point reached by Dr. Weddell, there is no path of any kind, the trees are of great height, and the ground is entirely choked up with creepers, fallen masses of trees and bushes, and tangled bamboos. In many places, the way led along the verge of a precipice overhanging the river, which boiled and surged many hundreds of feet below. Our encampments were made each night on any stony beach we could find, where there was space to light a fire and pitch the tent, and all day we toiled and struggled through the closely-woven jungle.

25. On the 3d of May I reached the confluence of the rivers Yana-mayu and Tambopata, where I formed an encampment, and resolved to make a thorough examination of the surrounding forests.

26. The forenoon of that day was devoted to the forest on the south-west side of the Yana-mayu ravine, a steep declivity, the lower part of which is covered with ferns, bamboos, palms, some spurious cascarillas, and trees with buttressed roots of stupendous size, to a height of 400 to 600 feet, when the calisaya region commences. In this locality twenty-five plants of the *Calisaya, var. a Vera* of Weddell were collected, two of them seedlings, the remainder root shoots, but with good roots of their own. The search was exceedingly fatiguing and dangerous work, scrambling through matted undergrowth and up steep declivities, in drenching rain, with rotted vegetation and saturated moss under foot.

27. In the afternoon we examined the forest-covered heights on the north-east side of the Yana-mayu, and twenty-one more calisayas were collected. I concluded from observations made on this day, that the calisaya avoids the banks of a river, never being found within several hundred feet of it, that it prefers the steepest declivities of the mountain sides, and a great deal, though not too much, shade. When in very shady places, i loses the purple hues on the petioles and mid-ribs. The plants were growing in moss, a few feet deep, which clung to the rocks.

28. On the 4th I made a toilsome and dangerous forest journey along the most giddy precipices overhanging the river, with no foot-hold but decaying leaves, nothing to grasp but rotten branches, every motion a drenching bath from the wet branches, every other step a painful and dangerous slip or fall. This tract of forest was remarkably bare of cinchonæ, without any apparent cause, and only ten calisayas were collected during the whole day. I also stripped the bark off a young tree to bring home as a specimen.

29. On the 6th the whole day was devoted to the search of a forest-clad height, on the south-west side of the Yana-mayu, called the "Naregada de Yana-mayu" and as this was a very successful day's work, and the locality seemed well adapted for the growth of the calisaya, I will describe it in some detail.

30. From 500 to 600 feet above the river, a ridge of rocks juts out from the forest-covered sides of the ravine, which is not nearly so densely covered with vegetation, where there are no palms, tree ferns, or plants requiring excessive humidity and where young plants receive shade from taller trees, while they also enjoy plenty of sunshine through the spreading branches. The most common trees at this spot were the *Melastomaceæ*, a tall grass called *Huichuhuichu*, the *Huaturus*, the *Aceite de Maria*, and the *Compadere de Calisaya.*

31. These, with a few *Cascarilla Carua* and *Cinchona pubescens* (*var Huinapu*), form the upper shade of the ridge of rocks; below there is an undergrowth of ferns, colocasiæ, and moss. In different parts of this ridge of rocks 124 young calisaya plants were collected, all growing out of the moss which covered the rock to a thickness of from eight inches to a foot, in company with a few beautiful hymenophyllums and other ferns. There was scarcely any soil, the roots spreading along the face of the rock, which is a clay slate, easily broken up into thin layers by the growth of the plants.

32. Having entirely exhausted the provisions, it became necessary to retreat upon Gironda's clearing, a distance of thirty miles, and the delicate operation of packing the plants, which had previously been deposited in damp moss under the trees, was commenced on May 6th. A Russia mat was cut in half to form two bundles, and the plants, the longest of which was cut down to a length of eighteen inches, were carefully packed in rows, on layers of rich damp moss, which was very abundant.

33. I had made two attempts to ford the river, which was much swollen and rushing along with great violence; but both times, after wading in up to my middle, the fury of the stream obliged me to return.

34. On May 7th we started in pouring rain, being entirely without food, and devoted some time to the search for calisava plants on the slippery sides of the magnificent precipice of "Ccasa-sani," where I collected twenty-one.

35. I was on the banks of the Yana-mayu river from the 2nd to the 7th of May, during which time the thermometer ranged between 75° and 70° at 3 P. M., and the coldest at night was 58°. It rained more or less every day, generally from a few hours after sunset until 10 A. M., when it cleared up; but on the 7th it rained all day.

36. Returning to Gironda's clearing, I formed a second encampment at a place called "Lenco-huayccu" on May 8th, intending to explore the forests in the neighbourhood.

37. Although in this ravine the calisayas seem to prefer very shallow poor soils, in rocky situations, they certainly could never attain to their largest growth without more and richer soil. If the experiment proves successful in India, it will probably be found advisable eventually to form the calisaya plantations on slopes where there is shade and moisture, but some rich soil, so as to enable the roots to increase to their fullest size, and the trees to attain their largest growth. Very humid or flat situations, especially near the banks of rivers, must always, however, be carefully avoided. The plants might first be placed under the shade of trees, which, when they began to interfere with the growth of the calisayas, could be destroyed. The calisayas which I saw seemed to propagate themselves to a great extent by throwing out numerous roots from the branches, in the same way as the vine.

*Cinchona Calisaya, var. Morada* (*Cinchona Boliviana of Weddell*).

38. This species is made distinct from the *Calisaya (var. a Vera)* by Dr. Weddell in his work, but in a letter to me, dated September 20th, 1859,

he says that, in his present opinion, it is hardly more than a variety of the calisaya, its bark being very generally collected and sold as that of the latter. He adds that it is not met with in Tambopata, but only in Bolivia, and in the valley of Ayapata, in Caravaya. I, however, found and collected it in great abundance in various parts of the valley of Tambopata. The bark collectors consider it equal to the other variety of calisaya.

39. On May 8th I searched the heights of Tambopata, and found a number of plants of the *Calisaya Morada* growing out of moss amongst the rocks, with hardly any soil, and on the 9th I resolved to make a third attempt to cross the river and examine the forests on the right bank. The river was forty yards broad, and rushing with great fury over the ford, but we succeeded in crossing it without accident. The day's work began by a very precipitous ascent through the dense forest for about 400 feet, when we reached a rocky ridge, and rapidly collected 109 good plants of the *Calisaya Morada*. This variety appears to prefer a *little* more shade and a *little* more soil (or, rather, holding ground, for it is entirely composed of moss and decayed leaves) than the *Calisaya, var. a Vera* of Weddell. It grows in the same rocky situations, with the roots sometimes actually in the crevices of the rocks.

40. I should add, that the *Calisaya Morada* has been chiefly met with in the upper part of the ravine, while the *Calisaya, var. a Vera*, was almost entirely collected near the Yana-mayu, and several leagues lower down the course of the Tambopata river.

41. On the 11th I went to see a plant of the *Calisaya Morada*, which had been planted in a small clearing, in order to obtain some particulars respecting its growth. I was told that it was planted in January 1859, from a root shoot less than a foot high. It is now 7 feet high, 6 and $\frac{4}{10}$ths inches in circumference round the trunk near the ground, and 3 feet 3 inches across the longest branches, from one side of the stem to the other. It was growing on the side of a steep hill open to the south and east, at the edge of a clearing, while forest-covered mountains rose up close behind it to a great height. The soil consisted of a yellowish brown loam, composed of the disintegration of the rock, mixed with decomposed vegetable matter.

42. These details respecting the transplantation of a calisaya were all that I was able to procure, beyond the statement of Dr. Weddel, that a calisaya planted as a specimen in Tambopata (now cut down) had a trunk two inches thick in 1847, when it was ten years old.

43. When planted in a richer soil in India, however, the calisayas will doubtless rapidly attain a growth equal to the largest of those in the Bolivian forests.

*Cinchona Calisaya. var. Verde.*

44. The bark collectors and other natives assured me that there are three kinds of calisayas, namely, the *Calisaya Amarilla* or *Fina (a Vera* of Weddell,) the *Calisaya Morada (C. Boliviana* of Weddell*)*, and the *Calisaya Verde*, or *alta*, or *blonca*, not mentioned, as far as I am aware, by any author.

They say that the latter is a very large tree, generally growing very far down the valleys, and in much lower situations than the other varieties.

The veins of the leaves are never purple, but always a pale green, hence the name. The guide Martinez had cut a tree of this variety yielding six or seven cwts. of bark, including *canuto* or bark from the branches : and Gironda had seen a tree in the province of Munecas, in Bolivia, which yielded ten cwts. of *tabla* or trunk bark alone. The true *Calisaya* of Weddell only yields three or four cwts.

45. I was very anxious to obtain plants of a variety which is said to attain so large a growth, and fortunately met with two, which happened to be growing on the heights of Tambopata.

*Cinchona Ovata, var. B Rufinervis, var. a Vulgaris.*

46. I was particularly recommended by Dr. Weddell and Mr. Howard to procure some plants of the above species of cinchonæ, which grow at much greater elevations than the calisayas, and I devoted two days to a very laborious search for them, which was rather unsuccessful, though not entirely without result.

47. On 5th of May I started with this object in view, to examine the forest-clad heights of Pacchani, high above the hills over Yana-mayu, and further to the north. After an ascent of 600 feet high over the calisaya region, we came to trees of the *Pimentelia Gomphosia*, with its bright laurel-like leaves and minute capsules, the *Cinchona pubescens*, and the *Cinchona ovata* (*var. a Vulgaris*). The whole day was devoted to a difficult and wearisome search for young plants, but we only found three root shoots, two of the *a Vulgaris* and one of the *B Rufinervis.*

48. On the 10th of May I passed another day in searching for plants of the *Ovata* species on some heights called Gloria-pata, immediately above Gironda's clearing. Trees were met with of both varieties, but very few seedlings or root shoots. The *Cinchona ovata*, though at a great elevation, inhabits the very moist parts of the forests, where the trees are covered with

12

dripping moss and hymenophyllums, the latter a sure sign of extreme humidity. They were also in a greater depth of decaying leaves than the calisayas, but little or no apparent soil; and there was much more shade, tree ferns, and palms growing round them. In the Zone just below grows the *C. pubescens*, and just above the *C. amygdalifolia* and *Cascarilla bullata*.

49. Altogether twenty-five plants of the *C. ovata* have been collected, nine of the variety *a Vulgaris*, and sixteen of *B Rufinervis*.

*Cinchona Micrantha (C. Affinis* of Weddell).

50. This species of cinchona is called by the natives *Motosolo* and *Verde Paltaya.* It grows in very low, damp situations, near banks of streams. I saw one tree laden with bunches of deliciously sweet small white flowers, actually drooping over the waters of the river Tambopata. Dr. Weddell informs me that the *C. micrantha* sometimes produces a good quality of bark.

51. The *C. micrantha* is found in company with many kinds of palms, tree ferns, bamboos, melastomaceæ, pacceys *(Mimosa Inga)*, *C. pubescens (var. Huinapu)*, and a *Lasionema*, called by the natives *Carhua-carhua blanca*, (and apparently different from the *Lasionema Cinchonoides* of Weddell) which is very abundant along the banks of the river Tambopata. Seven good plants of the *C. Micrantha* were collected.

GENERAL RESULTS.

52. By the 10th of May the collection was sufficiently large to fill the fifteen Wardian cases which were provided for its reception at the port of Islay. We had procured 529 cinchona plants, more or less promising, namely :—

| | |
|---|---|
| Chinchona Calisaya, *var. a Vera* of Weddell - - - | 237 |
| Cinchona Calisaya Morada, *C. Boliviana* of Weddell - - | 183 |
| Cinchona Calisaya, *var. B. Josephiana* of Weddell - - | 75 |
| Cinchona Calisaya Verde - - - - | 2 |
| Cinchona Ovata, *var. a Vulgaris* of Weddell- - - | 9 |
| Cinchona Ovata, *var. B Rúfinervis* of Weddell - - | 16 |
| Cinchona Micrantha, *C. Affinis* of Weddell - - - | 7 |
| | 529 |

53. The plants collected at the Yana-mayu encampment were conveyed in two bundles on the backs of Indians to Lenco-huayccu, on the 7th and 8th of May, and again deposited under the shade of trees, with their roots in damp moss, together with the additional plants collected during the days devoted to searches in the forests near Lenco-huayccu.

54. On the 11th of May the collection of plants was prepared for the long journey across the Cordilleras. The plants were placed in rows, with thick layers of damp moss between them, and sewn up in Russia matting, forming four bundles, which measured 2 feet 6 inches by 2 feet. They were marked Nos. 1, 2, 3, and 4.

Nos. 1 and 2 containing *C. Calisaya, vars. a* and *B*
No. 3 „ chiefly *C. Calisaya Morada.*
No. 4 „ some *C. Calisaya Morada,* two *C. Calisaya Verde, C. Ovatas,* and *C. Micranthas.*

55. Specimens of rock were collected and marked in all the localities where cinchona plants were met with. I considered it unimportant to bring away soil, as it appeared to be merely the disintegration of the rock, and the cinchonæ, growing chiefly in moss, seemed to be quite independent of it.

56. All the leaves of the calisaya trees were more or less eaten by caterpillars, and the roots, especially of the young plants, were frequently attacked by the larva of a beetle, which bored holes through them. When this happened, it was observable that the plant began to throw out roots just above where the larva had deposited itself. I collected three specimens of the caterpillar on the leaves, and one of the animal in the roots, and preserved them in spirits.

### The Valley of Tambopata.

57. The whole of the cinchonæ, with the exception of the *Josephiana* variety of calisayas, have been collected in the valley of Tambopata, and I, therefore, endeavoured to collect as much information as possible respecting the soil and climate of that locality.

58. The river Tambopata rises at a place called Saqui, at the foot of the ridge dividing Peru from Bolivia, and, after a course of twenty leagues through a forest-covered ravine, the sides of which rise up abruptly and end in lofty mountain peaks, unites with another river called Pablo-bamba or San Cristobal, which flows from the other side of the Cordillera of Saqui. The united streams form an important river, which enters the plain country to the eastward, and finally falls into the great river Ynambari or Purus.

59. The sides of the ravine of Tambopata are composed of a rock which I believe to be a yellow clay slate. When exposed to the weather, it quickly turns to a sticky yellow mud, while below the surface it is very brittle, and easily breaks off in thin layers. Veins of white quartz run through it, and, as in all the other valleys of Caravaya, gold is found in the bed of the river.

60. The height of the ravine of Tambopata above the level of the sea is between 3,000 and 4,000 feet, and I collected the following information respecting the climate from the natives :—

*January.*—Incessant rains, with damp close heat both day and night. No sun. Fruits ripen. *C. Pubescens (var Huinapa)* in flower.

*February.*—Weather as in January. Coca harvest. *C. Calisaya* in flower.

*March.*—Less rain, hot close days and nights. Little sun. Bananas ripe. *C. Calisaya* and *Pimentelia* in flower.

*April.*—Less rain, with hot humid nights, and little sun during the day. *C. Micrantha* in flower.

*May.*—A showery month, with little heavy rain. From May 1st to 12th the thermometer ranged from 62° to 71° at 7 A. M., from 69° to 75° at 3 P.M., and from 58° to 68°, the minimum, at night. The trade wind coming up the ravine brought clouds and rain. Month for planting coca and sugar-cane, and what is called the *michca* or small sowing of maize. Edible roots sown. Coffee harvest begins. *C. Micrantha*, *C. Amygdalifolia*, *C. Pubescens*, *Cascarillas Carua* and *Bullata*, *Gomphosia* and *Lasionema* in flower.

*June.*—Dry and very hot month. Much sun and little rain. A good time for sowing edible roots. A coca harvest early in the month. Oranges and paccays ripen. Cool nights, but a fierce heat during the day.

*July.*—The driest and hottest month, with cool clear nights. Very few showers. Time for sowing pumpkins, gourds, and water melons. *C. Ovata* flowers.

*August.*—Generally dry, trees begin to blossom. A month for planting Bean harvest. *C. Calisaya*, *Pimentelia*, and *Gomphosia* ripen.

*September.*—Rains begin. Coca harvest. Time for the blossoming of many trees.

*October.*—Rains increasing. Paltas ripen. Maize harvest, and time for sowing the *Sembra grande* of maize. *C. Micrantha*, *C. Pubescens*, *C. Amygdalifolia*, *Cascarillas Carua* and *Bullata*, and *Lasionema* ripen.

*November.*—Heavy rains. Coca harvest.

*December.*—Heavy rains. Pumpkins and gourds ripen. *C. Ovatas* ripen.

61. Edible roots yield a year after planting, sugar-cane in two years, maize and beans in six months ; coca gives three harvests of leaves a year.

62. Almost the whole of the ravine is one huge virgin forest, clothing the sides from the banks of the river to the summits of the mountain peaks

There are a few small clearings in the upper part of the ravine, the produce of which supports the inhabitants, about twenty souls.

DIFFICULTIES WITH THE NATIVES.

63. With regard to the Indians who carried the provisions and plants, they were very suspicious and expected ill treatment. On two occasions, they had resolved on deserting me and returning to their homes, in which case the failure of the enterprise must have followed. My knowledge of the Quichua language and of the habits and feelings of the Indians, alone enabled me to manage them, and retain them in my service during a period of perilous and very laborious work.

64.* But the principal difficulties arose from the obstacles which the petty local authorities attempted to throw in my way. Senor Gironda, who had been very friendly and had assisted me in various ways, was a justice of the peace, and the only authority in the ravine. On the 11th of May, just after the plants had been sewn up ready for their journey, a letter to Gironda arrived from Don Jose Bobadilla, the Alcalde Municipal of the district of Quiaca, saying that he had received positive intelligence that an English stranger had entered the forests to collect cinchona plants, to the serious injury of the people of this country, and ordering Gironda not to permit me to take a single plant, and to send me and the man who had assisted me as prisoners to Quiaca. The rest of the letter, which is in very bad Spanish, relates to other business. I had reason to believe that a busy, meddling Peruvian, named Don Manuel Martel, had stirred up this opposition, and my opinion was confirmed when I heard that his son was the bearer of the letter. Gironda, though civil and obliging, was very anxious to throw all the plants away, in obedience to his instructions, and I found it necessary to make a rapid retreat, in order to save them.

65. Next day, just before starting, I heard that the ignorant people of Quiaca had been stirred up against me by Martel and Bobadilla, and that they were sending a party down the valley to seize the plants. This news hastened my departure, but I met with other obstacles at Sandia, chiefly caused by the machinations of the same Martel, which gave me considerable trouble. These annoyances obliged me to make a rapid journey with the plants, direct to Arequipa, without entering any town or village whatever, while the gardener went round by Crucero to get my luggage. This resolution was fortunate, as the gardener found Martel awaiting my arrival at Crucero with the plants, in order to lodge a complaint against their extraction with the Sub-Prefect.

66. Some knowledge and experience of the people with whom I had to deal, and a succession of very fortunate accidents, alone enabled me to overcome these obstacles, which, for some time, threatened the complete failure of the enterprise; and it would certainly be useless to attempt to enter this province for a similar object, at least for some time to come.

RAPID JOURNEY WITH THE PLANTS FROM THE FORESTS TO THE PORT OF ISLAY.

67. On the 19th of May I left the ravine of Tambopata with the plants, and reached Sandia on the 15th. In passing through a forest in the road, one of the mules fell down a precipice for twenty feet, the fall being broken by dense underwood, and more than two hours were occupied in cutting trees and brushwood down to clear a way for him to get out.

68. At Sandia I found great difficulty, and met with much hindrance in procuring the means of proceeding on my journey; but, at length, I obtained two mules for the plants and an Indian to assist me to load them, and I resolved to make my way direct across the Cordillera, without entering any town or village, to a place called Vilque, where a great fair was going on, and whence I could hire mules to Arequipa. The gardener was sent by Crucero to pick up my luggage.

69. Since leaving Sandia on April 24th up to May 25th, we had walked over 174 miles, which may not, at first sight, appear very much; but when it is considered that it was chiefly not walking, but scrambling on hands and knees up precipices or through dense forests, and that there was not one day given up to rest, while the supply of food was exceedingly small and precarious, I think it will be considered tolerably good work.

70. On the 17th of May I left Sandia, with one Indian and two mules carrying the plants, and halted under a splendid range of frowning black cliffs near the summit of the snowy Caravaya range. On the 18th I reached the summit of the range, and commenced the journey over vast grass-covered plains covered with stiff white frost. After being eleven hours in the saddle, I stopped at an abandoned shepherd's hut built of loose stones. The plants, well covered with the tent and blankets, were placed by my side during the night with the thermometer between us, which, at 6 A. M., was at 20°. The days and nights bitterly cold, but very fine, and generally cloudless. On the 19th I was ten hours in the saddle, and passed the night again in an abandoned hut with the plants beside me, where the minimum of the thermometer was 30°. Two more journeys of similar length, when the minimum during the night of the 21st was 21°, and of the 22nd 16°, brought me to Vilque, where I procured an arriero and mules to convey me to Arequipa.

The sufferings during my six days' journey over the lofty plains from Sandia to Vilque were very great. The cold was intense, the work I had with the vicious, unmanageable mules was a constant source of anxiety, and I had no food whatever beyond a little parched maize. Each day I was upwards of ten hours in the saddle.

71. Leaving Vilque on the 24th, by forced and rapid marches over an uninhabited and frozen-tract of country, exposed to furious gales of intensely cold wind, I reached the city of Arequipa on the 27th, having travelled over 350 miles of difficult country in ten days, having to accommodate myself to the pace of a walking Indian, and pass much of the time in chasing the vicious mules. I was never less than ten hours in the saddle.

72. At Arequipa, I found the moss which enveloped the plants still damp; but I watered them once or twice during my stay there between the 28th and 30th, during which time the range of the thermometer, day and night, was between 56° and 60°. On the 31st, I left Arequipa, and, crossing the desert, the plants were safely deposited beside the Wardian cases at Islay on June 1st. The gardener arrived at Arequipa on May 29th.

ESTABLISHMENT OF THE PLANTS IN THE WARDIAN CASES.

73. Having written to Mr. Wilthew, Her Majesty's Consul at Islay, immediately on my arrival at Arequipa, he had kindly caused the Wardian cases to be placed in the yard of an English carpenter, and had procured a supply of good soil from the ravine of Mataranes, at the same spot whence I sent a sample for analysis with my letter to Dr. Forbes Watson (No. 2).

74. The plants, which were found on the whole to be in a favourable state, were planted in the cases and well watered during the 2nd and 3rd of June. The cases being numbered from 1 to 15, a rough account was kept of what plants were deposited in each, some in the flower-pots which had just arrived from England, and those with larger roots loose in the soil.

75. The large-rooted plants without any foliage are in cases, with moss covering the soil, so as to supply them with more moisture. The contents of the Wardian cases are as follows:—

| | |
|---|---|
| No. 1. Calisayas (*var. B Josephiana*) in pots - - | 50 |
| „ 2. Calisayas (*var. a* 16 and *B* 25) - - - | 41 |
| „ 3. Calisayas (*a*) - - - - - | 34 |
| Carried over - - - - | 125 |

| | | |
|---|---|---|
| | Brought forward - - - | 125 |
| No. 4. | Calisaya Moradas (*C. Boliviana* of Weddell) - - | 38 |
| „ 5. | Calisaya Moradas, in pots - - - - | 42 |
| „ 6. | Calisaya Moradas 14 (*C. Micrantha*; 1 large *C. Ovatas*) - | 15 |
| „ 7. | Calisaya Moradas (and the 2 *Verdes*, large, *C. Ovatas*) - | 18 |
| „ 8. | Calisaya Moradas (2 *C. Ovatas*, &c., in pots, *C. Micranthas* 4) - - - - - | 49 |
| „ 9. | Calisaya (*a*) n pots - - - - | 28 |
| „ 10. | Calisaya Moradas - - - - | 32 |
| „ 11. | Calisayas (*a*) - - - - - | 32 |
| „ 12. | Calisayas (*a*) and Moradas, unpromising - - | 15 |
| „ 13. | Calisaya Moradas, small and good - - - | 32 |
| „ 14. | Calisayas (*a*) large - - - - | 15 |
| „ 15. | Calisaya Moradas (*C. Ovatas*, &c.) - - - | 15 |
| | | 456 |
| | Plants killed by the cold of the Cordilleras, broken on the journey, or lost - - - - - - | 73 |
| | | 529 |

76. The flower-pots, most of which were broken on the voyage, are of two sizes, No. 40 and No. 60. The plants will be watered every day, and carefully attended to until the day before shipment, when the soil will be battened down, and sashes screwed on. In the meanwhile they are kept screwed down, so as to create an artificial atmosphere after being watered, and screened from the heat of the sun at midday Islay is always exceedingly dry, but June is, on the whole, a favourable cloudy month, thermometer ranging between 64° and 74°.

### SEEDS.

77. It was my intention to have returned to the forests of Tambopata for seeds of the *C. Calisaya* towards the end of July or the beginning of August; but the opposition I afterward met with convinced me that any attempt to make the collection personally would be worse than useless. Generally speaking, I have no confidence in native agency; nevertheless, under these circumstances, I have thought it my duty to make several arrangements for procuring a supply of calisaya seeds, which, if they fail,

will cause no expense, and, if successful, will require an outlay of about 50l. I have good grounds for believing that a supply of several thousand seeds will be forthcoming; but all dealings with natives are uncertain.

EMPLOYMENT OF MR. PRITCHETT IN HUANUCO.

78. The Secretary of State having shown his sense of the importance of obtaining as many different species of the cinchona plant as possible, for introduction into India, by authorising me to expend 500l. additional, in procuring plants or seeds from the forests of Huanuco and Huamalies, I have succeeded in procuring the services of a Mr. Pritchett for that purpose. While at Guayaquil, I received a very favourable report of the character and qualifications of that gentleman from Mr. Cope, Her Majesty's Consul-General in the Ecuador, and I resolved to employ him in the event of his coming out to these countries.

79. Mr. Pritchett arrived in Lima on the 10th of April, and was at once supplied with funds to enable him to start for the forests, together with a paper of instruction respecting the species of cinchona plants which are found in Huanuco and Huamalies, with some notes on the mode of collection.

80. During my short stay in Lima, I shall endeavour to have some Wardian cases made for his plants; but I shall, at the same time, instruct him to turn his attention chiefly to the collection of seeds. I trust that, by September, he will have been enabled to collect a good supply of the species found in Huanuco region, which are so well known to botanists through the work of Ruiz and Pavon and the accounts given by Poëppig.

CONVEYANCE OF THE PLANTS TO INDIA.

81. After some consideration, the gardener and I have decided that it will be best to give the plants some time to establish their roots in the flower-pots and cases, previous to their embarkation. I shall, therefore, proceed with them to England by the steamer which passes Islay on the 25th of this month, and expect to arrive at Southampton on the last day in July. The monsoon is not over in the Neilgherry hills, I believe, until the end of September; and it may, therefore, be thought advisable to wait between two mails at Southampton during the warm month of August; but this question will be decided in England.

82. I, of course, propose to accompany my collections to their final home in the Neilgherry hills, as it is very important that I should examine the sites prepared for their reception, or proposed to be used for their future culture,

and thus be enabled to supply Dr. Cleghorn and others with all the information I possess. I should also be on the spot when the collections of Mr. Spruce and Mr Pritchett arrive.

83. John Weir, the gardener who has accompanied me, has been very efficient in his special duties of packing the plants and establishing them in the Wardian cases, and has displayed much zeal and interest in the enterprise, during the period of his service. I consider him fully entitled to the extra 60*l.* a year, the receipt of which was to depend on the report I was enabled to make of his conduct.

84. In addition to specimens of rocks and of the animals which feed on the cinchonæ, a collection of dried leaves, capsules, and flowers of the cinchonæ was made, but, owing to the excessive humidity and continual rains, and the impossibility of devoting sufficient time and attention to them, they are in a very damaged state. Specimens of bark, and small branches of cinchonæ and allied species, with their *canuto* bark, were also collected in the forests.

85. Trusting that the numerous deficiencies of this Report will be excused, in consideration of the weak and exhausted state in which I arrived here, and the short time I have had to write it before the arrival of the steamer, while much occupied with other duties connected with the establishment of the plants in the cases.

I have the honour to be, &c.,
CLEMENTS R. MARKHAM,
*Junior Clerk in the India Office,*
*on Special Service.*

---

*Communications on various subjects.*

The following letters were likewise read :—

1.—From S. H. Robinson, Esq., submitting some papers collected by the Mutla Association respecting the culture of cotton in the Soonderbunds. (Referred to Committee of Papers.)

2.—From J. E. Macdonald, Esq., Honorary Secretary, Agri.-Horticultural Society, Singapore, dated 25th September, announcing the formation of a Society at Singapore, and requesting co-operation. Agreed to.

3.—From James Cowell, Esq., offering to obtain some more French Madder seed for the Society, as the last small quantity received has proved encouraging. Agreed, that Mr. Cowell's kind offer be thankfully accepted.

4.—From Major J. R. Thelwall, C. B., Mussooree, on tea-planting in the Deyrah Doon. "The Deyrah Doon is becoming a great tea-producing district, and, from my own experience as a tea planter for seven years, likely to become soon the tea-paying district of India. I have twenty acres of plant produced from seed grown on Hurbunswala from *highly* cultivated trees. It is now twenty-two months since the seed from which they were produced was picked, and the produce this season from these young plants is over ten pounds of the finest tea that can be made per acre. Only the two fine upper leaves being picked to prevent their shooting up too high and not bushing. Hops grow luxuriantly in the Doon and flower freely, and the arrowroot beats every thing I have ever seen before"

5.—From T. A. M. Gennoe, Esq , Ghazeepore, sending specimen leaves and flowers of the "*kurma*" tree of the Nepal Terai, of which he sent a specimen of wood in April last. Doctor Thomson recognizes these specimens as belonging to *Nauclea cordifolia*, the "Chukulta" of Bengal.

6.—From the Secretary Royal Asiatic Society, London, returning thanks for copies of recent publications of the Society.

7.- From Professor Oldham, Superintendent of the Geological Survey of India, to the same effect.

---

*(Monday, the 26th November, 1860.)*

C. A. Cantor, Esq., Vice-President, in the Chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected members :—

Captain C. M. Fitzgerald, Captain E. Chamier, Captain T. Dennehy, Captain Forsyth, Captain H. R. Drew, the Rev. Malcolm S. Laing, Messrs. J. W. Gaistin, George Williamson, G. N. Wyatt, F. M. Gibbon, R. H. Smith, J. C. Johnson, and Henry Burrows.

The names of the following gentlemen were submitted as candidates for election :—

Captain Woodcock, (Bombay Levy), District Superintendent of Oude Police, Gonda,—proposed by Captain James Williamson, seconded by the Secretary.

H. C. Sutherland, Esq., C. S.,—proposed by Mr. Charles Steer, seconded by Mr. R. H. Russell.

T. A. Cleve, Esq., Tea Planter, Hopetown, Darjeeling,—proposed by Mr. F. Brine, seconded by the Secretary.

Colonel Hurry Bhukt, Nepalese Ambassador,—proposed by Mr. R. Lauder, seconded by Mr. W. G. Rose.

W. Sowerby, Esq., Civil Engineer,—proposed by Mr. Cantor, seconded by the Secretary.

---

The following presentations were announced :—

1.—The Annals of Indian Administration, Part 3 of Vol. IV. Presented by the Government of Bengal.

2.—Annual Report of the Geological Survey of India. Presented by the Government of India.

3.—Journal of the Asiatic Society of Bengal, No. 3 of 1860. Presented by the Society.

4.—A small collection of Orchids from Upper Assam. Presented by G. W. Wagentrieber, Esq. These have reached in good condition.

5.—A collection of Mango and Fig grafts from Bombay. Presented by the A. and H. Society of Bombay. The Mangoes have arrived in fair condition, but the Figs are very sickly.

6.—Sundry specimens of Cotton raised in the Hyderabad Assigned Districts, from foreign seed. Presented by the Government of India. (Referred to the Cotton Committee.)

7.—A sample of Sea Island Cotton from a few stray plants growing in the Cotton plots in the public garden at Umritser. Presented by H. Cope, Esq.

"Looking over, a few days since," writes Mr. Cope, "the several foreign cottons growing luxuriantly in the Umritser Garden, I noticed a few plants differing in general appearance from the rest, and found on examining some ripe bolls, that they were to all appearance Sea Island plants. I enclose you a small quantity of the cotton, to enable you to confirm my belief on the subject. If I am correct, I see no reason why the plant should not grow in large numbers here, and produce equally fine cotton to that I now send, and I hope you may have it in your power to send a supply of seed, however small, it will be most acceptable, before March next. I shall of course preserve most carefully all the seed I may obtain from the few plants I now allude to."

This cotton is apparently from Sea Island stock, but it is pronounced to be rather weak, and not so long and fine in staple as good Sea Island.

8.—A sample of Brown Cotton from Ellichpore. Presented by Captain Ivie Campbell.

The following is what Captain Campbell writes respecting this Cotton :—

"I send to-day, by bhangy, a small parcel of a specimen of Brown Cotton.

The specimen is not, I am sorry to say, a good one. It was plucked while I was absent more than a year ago, and thrown aside, the seeds being separated, so that you will not be able to judge of the size and weight of each pod, or, easily, of the value of the cotton, or the quality of the fibre. It is the produce of a large shrub, which I found growing in an out-of-the-way corner, partly under shade, of my garden, on coming to this station three years ago. The plant was then apparently two or three years old, and died off last year; but several seeds which had fallen from it germinated and grew during the rains to strong plants, even on gravelled walk; they were rooted out, with the exception of one plant, of which the sample is part-produce. The leaf is a large and broad one. The natives, who do not know the plant, and never saw cotton of this colour, consider the fibre good, and fancy the colour. It is perhaps a Chinese variety; will you kindly let me know if it so, and whether it is of any value. It is not known when or whence it was introduced here.

"The plant in my garden is now in blossom, and if you should be of opinion that it is worth cultivating, I shall preserve specimens of the cotton, &c., and forward them to you. The plant could, I am sure, be grown in the fields, equally well with the common cotton of Berar."

This cotton is apparently what is known as "Nankin Cotton;" it is of short staple, and closely adhering to the seed; it is difficult to assign a value to it.

9.—Samples of bolls and seeded Cotton raised at Chowparun, near Burhee, from New Orleans seed received by the Society, through the Bengal Chamber of Commerce, from the Manchester Cotton Supply Association. Presented by C. E. Blechynden, Esq.

The following is extract of letter from Mr. Blechynden, accompanying these samples, dated 12th November:—

"I send samples of Cotton grown by me from the seed you kindly sent me. I shall be glad to know what opinion is formed of it. You must recollect we have had a very trying season this year, little or no rain, and that breaking up so early. Next season the natives will take cotton seed, having seen the result of my fields. Five pods of country cotton are required to weigh against one of mine!

"I send a specimen of the country cotton grown by me; it is far superior to what is grown here by the natives."

Mr. Hurst, a member of the Cotton Committee, thus reports on this sample:—

"Beautiful colored, long-stapled, valuable cotton of strong fibre, superior to

middling Orleans, and if properly ginned, would fetch about ½*d*. per lb. more in Liverpool."

The following is extract of a second communication from Mr. Blechynden, in reply to enquiries for more detailed particulars respecting the above cotton :—

"I hasten to send you the information you require about the cotton, and am glad to find it is approved of. I have one and-a-half beegahs of land under cotton cultivation ; it contains 10,000 plants : their average height is two feet. I commenced sowing on the 26th June, but had to repeat the process, as from want of rain many of the seeds did not germinate ; the cotton showed itself in August, when the plants were little more than a foot high. I gathered the first pod in the middle of October (16th), since which time there have been almost daily gatherings ; the plants are growing and throwing out flowers to this day. I send by to-day's banghy post, bearing, two plants with their bolls on, one country and the other American ; they will speak for themselves. I average a produce of 30 bolls per plant. Cotton has been taken off the plants I send ; they are borne down with the weight of the pods. The soil is high land, clay with much sand and stones quartz ; the field is a new one, and not manured before I took it. I pay for the two beegahs I have (rupee 1) one rupee per annum. The *best* land here can be had for Rs. 2-8 per annum the highest. If we had had the usual quantity of rain, the cotton would have been better, and the crop come in more simultaneously ; and if I had had the means of irrigation to supply this deficiency of moisture, no doubt the crop would have been better, but the past season has been an extraordinary one, and cannot be taken as a rule. The usual sort of season would not require after-irrigation. My reason for supposing that irrigation would have benefited the crop, is based on plants near the well in the field where a little moisture gets to them, looking healthier. The cost of getting the two beegahs under cultivation, inclusive of ploughs, coolies, clearing jungle, manuring, an outlay that will not occur again, was Rs. 13, or Rs. 6-8 a beegah. I had off the same ground, and growing at the same time between the cotton ridges, 85 maunds of Indian corn ; this grain is now selling here at one rupee per maund. I had also about 20 maunds of cucumber, not so bad. Country cotton, after the seeds are taken out, sells for four annas a seer here."

It was agreed to transfer this cotton to Mr. Hurst, for transmission to the Manchester Cotton Supply Association.

---

Mr. Hurst, as Honorary Agent, submitted the medals (two gold and six silver) which the Manchester Cotton Supply Association have placed at the

disposal of the Society, as communicated in their Secretary's letter, which was read at the last Monthly Meeting, to be presented to successful cultivators of cotton in India.

*Resolved*, that the best thanks of the Society be tendered to the Association for these medals.

---

A recommendation was brought up from the Council, for disposal at the next Monthly Meeting, to the effect that the salary of Mr. McMeekin, Head Gardener of the Society, be increased from Rs. 150 to 200 per mensem, from the commencement of his second year's term of service.

---

A statement of the percentage germination of the collection of English flower seeds received this season from Messrs. James Carter and Co., was submitted by the Gardener. The result is, altogether, unsatisfactory; while a few kinds show a result of 60 and 70 per cent., others range from 40 downwards, and some have failed altogether. The average percentage is only 19¼.

---

*Artificial Irrigation.*

The Secretary read the following extract of a letter from Mr. R. W. Bingham, of Chynepore, dated 2nd November, on the important subject of irrigation, in continuation of remarks submitted at previous recent meetings :—

I shall try and let you have the cotton paper soon ; the *Irrigation* paper will not, I fear, be ready by that time, as I have to wait for replies to queries on the subject from several practical Engineers in England, Scotland, and the United States. I think it is time more practical conclusion was come to, and self-interest is a most powerful lever: I feel that lever just now, and feel that if I am to make anything valuable out of my estates, I must have irrigation at command, so do thousands feel in India ; and I have a faith that with the correspondence invoked on the subject by the publication of my remarks on the subject in the Society's Proceedings, that some practical conclusion will now speedily be arrived at, but it will not do to condense all these remarks and correspondence till I (at least) think that such is the case ; this cannot be the case before February or March next : and then I hope I shall see my way before me. Meanwhile the "Proceedings" will keep the matter open to public discussions, and probably something practical may even be hit upon in India. In the meantime, however, here are a few passages which I have received.

To begin with my correspondent's letter, T. T. Pearson, Esquire, of Manchester, dated Manchester, August 18th, 1860. He says—"I will resume the subject of last letter in relation to the pumps. I gave you particulars of "Palmer's patent Rotary Pump," and trust you will have received the letter ere this arrives. I think I did not mention the piping which will be required for connecting the pump with the water, be that 2 inches or up to 6 inches diameter, perhaps you can get this in India, or if not, it could be sent out at the same time. It is of course *iron* piping in lengths to be joined as you will know; it is the ordinary kind as used for warming apparatus, gas, &c., &c. I have received a reply from one of the referees, and will give it you in full. It is from Mr. Cross, of the St. Helen's Canal and Railway. He says—

'I have used one of Palmer's pump (2½ inches) for pumping out the water while rebuilding a lock on this canal, and never saw anything to equal it. I drove it at about 250 revolutions per minute, and it kept the pipe perfectly full, passing chips, cinders, and all sorts of rubbish that would have instantly stopped any ordinary pump. The pump cannot well draw water more than 20 feet, and ought, I think, to be placed as near the water as possible; but it will throw the water from 20 to 200 feet, according to the size, and speed at which it is driven, and I believe it would be found very efficient for irrigation in India; at present I am recommending the erection of a pump of this description to drain 1100 acres of land in Ireland, which has been reclaimed from the sea.' My correspondent continues,—You will see, that there is a feature here named which I had overlooked in my last: the arrangement for casting off anything, which would in all probability get into the pump while working, from the river or tank; and which I should consider a great recommendation to it. I have applied twice to Mr. Johns, of Chester, who occupies a similar position to Mr. Cross, and has had a large one in work some time, but have not had an answer as yet. However, this is very satisfactory, and I should think the principle superior to any windmill power, depending as this I suppose would do, on that most uncertain element, the atmosphere; whereas here you can work at any time, so long as labour, manual or otherwise, is available. Lest the letter should not have arrived, I will give you the particulars again.

| | | | | | £. | s. | d. |
|---|---|---|---|---|---|---|---|
| Hand | 2 inches | discharge | 150 galls. per minute | | 15 | 0 | 0 |
| Power | 2½ | „ „ | 200 | „ „ „ | 20 | 0 | 0 |
| „ | 3½ | „ „ | 400 | „ „ „ | 30 | 0 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power 4½ inches discharge 800 galls. per minute | | | 40 | 0 | 0 |
| „ 6 „ „ 1000 „ „ | | | 50 | 0 | 0 |
| „ 6 „ „ „ „ „ | double year | | 65 | 0 | 0 |

I don't think Fowler and Co. can have heard from Australia about the gear, to be sent there. I will not forget it, though I do think this will be the thing for you; but you must judge. The small one in case would weigh from 2 to 3 cwt., and so on."

Now follows an extract from a letter from A. G. Murray, Esquire, dated Seharunpore, Sept. 20th, 1860, which I think you will find of interest. He says—

'This is a great place for irrigation, and is watered to a certain extent by the East Jumna Canal. You have not got correct information about this country (North-Western Provinces). Irrigation is carried on to a great extent only limited by the water in the canals, and all sorts of row occur about water. The great fault of the canals is, that they can't irrigate the whole Doab, as between Alleghur and Meerut the country is dried up, and *the rain crops* are a failure.* Branches are made and making all about Meerut and Booloondshur: but the fact is, the Ganges Canal has not water enough: in fact, if it gives water for $\frac{1}{10}$, it is as much as it does. The head of the Ganges Canal is very bad: it is not a permanent head: merely a dam of stones and sand. The water at Roorkee is *said* to run 2½ miles per hour, and is some 30 inches deep by 180 feet wide. A person here who irrigates, and has water in two days per week, says it is not nearly enough, in fact it is a perfect mockery, as he can only irrigate from 20 to 30 acres per week with his allowance, while he has some thousand acres which require it. Now, this is the proportion in which the water is divided to all the cultivators, or about 2 per cent. of the amount required, so you can have a guess of what use the canal is. Government, however, charge by the acre irrigated, and of course people try to get the largest crop possible off the smallest area, and on the other hand, the Engineer says, they put far too much water on the land.† It is not easy to know the proper quantity of water needed per acre.‡ The general appearance of the country about here, however, plainly shows that there is not near enough water.'

* How does the Scripture adage fit here—"If such is the case in the green tree, how is it in the dry?"

† The Engineer is wrong. People will not drown their crops: but when irrigation is paid for by acre, will take as much water as required.

‡ Of course not. This will differ with the season and the nature of the soil, but an average might be struck, which the Government might charge fairly for as an acre's water.

* * * * * * * * * * * * *

'As you seem to think a deal of the Persian Wheel worked by a windmill, I will let you know my notion of one, especially as I have seen Persian wheels at work at Seharunpore. The water is only some 30 feet down. The pucca well must be larger than the wheel, in order to let it work: this adds considerably to the expense; the other machinery is of course very rough, and therefore very cheap;* it is rough bevel wheel. The bullocks turn one wheel round, and another with rough cogs works into it, and in the further end of its spindle there is another wheel made of spars. This overhangs the well, and carries a double-lashed belt. The wheels are all about six feet in diameter, and there is a good lot of slack rope which hangs down in the water. On this double belt, earthen pots are tied like the common toddy pots, each holding about two quarts. These wheels are extensively used in gardens: in the field there are hardly any wells, and those are worked with the leathern buckets and rope. There would be no trouble in rigging up a rough windmill to work a Persian wheel which is after all the most possible method in this country.

'You need a large pucca well, the larger the better. It should be 25 feet indiameter; over this you should build a good strong tower, say 50 feet high to carry your vanes and hood and hold the necessary wheel, spouts and pots*; you could put one up for about Rs. 2,000. I again repeat, it is no use putting up a small thing: it would be only to play with. To make it perfectly plain, a professional drawing would have to be made, and there are several practical difficulties of detail, the working out of which would need consideration. The principal difficulty is the variable force of the wind.

'I may as well tell you that Persian wheels are not much used near Agra: only the leathern bucket and rope;† and windmills are in great measure given up in England and Holland, and large engines substituted.'

This is no doubt a fact; but how would large engines have answered in England a century ago, before her present trained Engineer Corps, and trained mechanics, trained engine servants, and all engine necessities had been created? Nay, how would large engines pay *now* in England or in Holland, with coal at near £5-10-0 sterling per ton, and that far inferior to English coal, which I am told is about the price now paid by river steam companies above Dinapore? Like all Englishmen I know the value of engines, and I know the value of a Railway train and of a steam boat; but to enable

---

* This is what is wanted; rough and cheap for native carpenters.

† This is probably economy of brick cost.

us to use them we must have for the first a fair supply* of skilled workmen, who are not yet to hand; good and cheap coal, not yet procurable; and to use the latter, we must have the iron road or the navigable river; where all these requisites are wanting, steam is premature: it would be using the power and cost of a giant on the work of a pigmy. No doubt, but that steam will penetrate Indian manufacture, &c., as it has done in those of all the civilized world, but I do not think the time for Mofussil steam, except by chartered companies who can work on a gigantic scale, has yet come. We can do for a few years with the old windmills of Holland and England, which ground the corn at least as cheaply and as well as steam now does, where labour was at a lower rate of remuneration. Labour is high in India, considering the work done per man, but is still cheaper than steam with coal at £5-10-0 per ton, and mechanic's wages at three to four times English rates; therefore, windmill power, however inapplicable to the high civilization and cheap steam of England, would be an appreciable boon to all Indian agriculturists, and would be replaced by steam as certainly, quietly, and effectually as it has been in England, Holland, and America, when its time arrived. No one can see the *certainty* of steam operations, and not wish that this day may soon come, and come soon it will as certainly as we are now crowding the works of a century of former time into a month of the present.

Mr. Murray in continuation says—'I saw the wheels at work at Seharunpore. I don't consider it very great improvement in the old leathern rope and bag; the pots * leak dreadfully, and are always getting smashed, and it stands to reason that a pair of bullocks won't lift more in 100 small pots than they will in a large bag, and though bag plan can be used in cutcha wells, and can be moved from one well to another, which the rope and pot plan can't be. I dare say you have seen a dredging machine; now I think your chain and bucket should be something in that plan, but of course lighter.'

This is the idea I have long since broached, but wants wind power attached to it. Mr. M. is however, I think, wrong in saying a pair of bullocks cannot lift more in 100 pots, &c.; of course they could not, provided the lift was one of direct action or only over one small pully block, as is the case with the present rope and bag: but the Persian wheel gives us the powerful leverage gained by the wide circle trod by the bullocks, being brought to bear on the cog wheel which turns the wheel spindle; and that force is, I should

* Yes: I can understand this, but why have pots? Would not small sheet-iron buckets serve the turn, strung in a slight chain instead of the perishable ropes.

say, at least 250 per cent. in favour of the Persian wheel. What are the China pumps which I hear are so much used in Lower Bengal? Are they not a modification of the Persian wheel? I should like to know this, and to know what is their effect, that is what power is required to lift 100 gallons of water per minute, and to what height can they work. "Palmer's patent Rotary Pump," if it answers the description of my friend and of Mr. Cross, appears nearly to have solved our problem. Have any of the members of the Society, or readers of the Journal or Proceedings ever seen the article, or used it in India? If so, a few words from them as to its value in this country would nearly settle the question. Perhaps some friends to Indian agriculture would take the trouble to answer this.

Another friend, R. L. Ewing, Esq., of Shahpore, writes—'Irrigation would make the land about us double the value it is at present, but the question is, how to carry it out on a large scale. I confess I am completely at a loss how this is to be managed; wells are at present the only means that can be employed, and with these only little or no increase to the land at present irrigated could be made.'

But these few words speak volumes as to the necesssity for irrigation in this district, and on a large scale. I was glad to see in a late official paper published, that the Government were awake to the fact. If Government officials only knew how to go to work, by commencing small portions of the grand plan at different places in the district, and at small cost *at once,* so as to show the natives the value of the works, (which they already partially know) I have no doubt whatever but that the *whole* line of the canals for irrigation could be constructed by a voluntary tax levied on their own class by the landholders themselves. I do know as a fact that I could, without asking Government for anything but moral support, construct the line from Muggurdah Pass to the Chynepore tanks, and distribute the water from them without costing the Government one stiver; the same could be done from the Sasseeram tanks *at once.* Natives are after all impressionable people, and if you can gain their confidence, they can see their own interest *(if present)* as soon as other people.

---

*Culture of Cotton in the Sunderbunds.*

Read a letter from Mr. S. H. Robinson, Secretary, Mutlah Association, dated 10th November, respecting the cultivation of Cotton in the Sunderbunds.

The correspondence referred to in the above letter was transferred for publication in the *Journal.*

### *Culture of Flax in the Punjab.*

Read the following communication from Mr. H. Cope, of Umritser, dated 15th October, announcing the gratifying intelligence of the formation of an English Company for the cultivation and manufacture of Flax in the Punjab.

"It may interest your Society to be informed, that there is now every probability of the Flax movement in the Punjab assuming a permanent form. You are aware, I believe, that on the arrival of Mr. D. F. McLeod in England, he visited the principal Flax marts in the country. At Belfast his presence was hailed with great satisfaction, and the merchants of that metropolis of the Irish Linen trade, formed themselves into an association for the cultivation of Flax in India generally, commencing with the Punjab, with a proposed capital of £50,000. So long a time elapsed since this measure was adopted, that I feared it might, like the Dundee Association, have fallen to the ground. Such has, however, I am happy to say, not been the case. The Company has been brought into active existence. All their preliminary arrangements were taken in concurrence with Mr. McLeod, whose great experience was of the utmost utility to the Association; and they are about to commence active operations in the Punjab. Mr. James Wightman, an experienced cultivator of flax in tropical climates, appointed their Agriculturist, arrived in Lahore about a fortnight ago, and I have been asked by the authorities to accompany him to Sealkote, and there assist him to the utmost of my ability. He has just saved the season, and will begin operations at once. Machinery is on the way from England to Kumaon, and ought to be up in time for the operations of breaking and scutching all that Mr. Wightman can obtain in the shape of straw, by next April, and I trust that in three years from this, Flax will appear on the Custom House returns as an important article of export.

"I propose, the moment I can find leisure, to forward you a short narrative of Flax operations, in continuation of my previous papers, and concluding with Mr. Wightman's arrival, which will inaugurate a new era in the cultivation; and think it right to add, that from all I have seen of Mr. Wightman, I consider him eminently fitted for the work he has been deputed to undertake.

"I may also mention, that Captain Urmston, Deputy Commissioner, Sealkote, proposes to distribute, on the 1st November next, on the plan commenced by Mr. Edward Prinsep, considerable rewards in bullocks, pugries, &c., to all the zemindars of the Sealkote District, who have succeeded above their fellow-cultivators in producing good flax. This measure will, no doubt, have a favourable effect on Mr. Wightman's enlarged proceedings."

### *Flora and Economic products of Bourbon.*

The Secretary read the following extracts from another interesting communication from Captain W. H. Lowther, written from Saint Denis, Reunion, 18th Sept., on the above subjects:—

"For a long time past I have tried to find a ship for Calcutta *direct*, and am still *minus* my desire. So I shall avail myself of a friend, *via Mauritius*, and will duly write to you when I hear of the box leaving that island; and it will be as well on your part in another twenty days to enquire at the various shipping offices in Calcutta, so that no time may be lost in saving all the contents. I very much regret they have not arrived during your *rains*, which would have given all the "Palms," etc., a better start; as it is, do not be surprised at any seeds not vegetating for months. Did you receive the packages or rather sacks of Palm Seeds? The smaller one contained the *Palmiste (Areca alba et rubra)*, the larger an entire raceme of *Sagus Ruffia* (*Morfia* of Bourbon and Madagascar), some hundreds of nuts. It is very possible they have miscarried, and anticipating such accidents, I now send a further supply of both, as also of those rare and magnificent Palms, *Euterpe Caribbea* with the Pestle-like trunk, and *Cocos flexuosa* of Brazils; no others have borne seeds this season, but there are quantities of nice young trees availab[illegible] (for the glass cases), of almost every species, and which that fine old man Richard has generously placed at my disposal. The seeds in that box of earth you allude to were, I think, those of a very large *Diospyros* (edible fruit), a tribe of which we have a very great number in these regions. *D. Sapota nigra* and *D. Kaki* are excellent fruits, especially the latter, and furnish cheap and plentiful nourishment to the lazy, sleepy African population of Bourbon. I have worked *hard* in the Vanilla line, as my despatches on that subject will prove to you; but *that promise*, as I anticipated, has never been kept, and I am now looking out in other quarters for a superior sample. Nearly every body is a *Vanilla* grower, but two-thirds of the product are very second rate as you may suppose. I am gradually filling a *second* tin case with the more delicate samples, *viz.*, the cloths of *Sagus Ruffia* fibre, the tobaccos, &c., &c., a catalogue of the Government Garden with remarks, the Vanilla Pamphlets, &c., &c. One of those textile aloes is now yielding seeds which I am carefully collecting; I hope to introduce both. The silky fibre from both species has created a great stir in France; it is described as superb: they are plants which ought to be thoroughly naturalized in *India*, which is better suited to their nature than this island, which I consider too mild in temperature and too

moist, as they come from the sandy coast of Senegal and Comoo Lakes. Richard has received a silver medal for them at the late Paris Exposition. *Sanseviera cylindrica* and *macrophylla* are their names.

"The *Palmiste* is such a delicious vegetable, and capable of being cooked in so many ways, that it will prove a great acquisition to our meagre diet in India, where we have so many thousands of square miles covered with useless, unwholesome weeds; of course, I speak of Bengal (especially *Assam*, Dacca, Sylhet, and every where indeed suited to the *Betel Areca* of India, and you ought to have enough seeds from my repeated consignments to supply all those districts). You should also encourage *Pandanus Vacoa* cultivation as much as possible, for all the uses before described to you: *here* it is the prevailing feature of the rural districts. I can send you any quantity of seeds.

"I think I told you that *Telfairia Pedata* is extinct in this Colony; it gradually died off, according to the account of the best botanist I have met in the island. I wrote to Mr. Duncan explicitly on the subject, and begged him to send you at least one of those large cases filled with it, if procurable at or near Mauritius. *Anona reticulata* is very fine here, and more nearly approaches its delicate congener *A. Squamosa* (*Shurreefa* of India) than I have hitherto found. I am sending you a large supply of its seeds. Have cultivators hitherto tried hybridization, or grafting of the two?

"There are also other desirable kinds of *Anona* grown here, but they are not yet in season. A gardener here ought to make his fortune, that is, if he brings *his supply of labour with him: for a small dish of cauliflowers 4 Rupees during the season*, and many other vegetables in like proportion. *Mangosteens* fetch almost their weight in *silver*: the trees grow nearly wild, but there are plenty of *Gourmands*, and very few gardeners!

"And now I must tell you of an Insect Pest which is just now ravaging "every green thing"—masses of white *Aphides* clustered together in the foliage, and blighting flowers and fruits in their course; even the *Vanilla* is said to be "touched," and there is every probability that nothing but some sudden counterblast of Nature herself can arrest the general plague. In France the *savans* have already established a vegetable quarantine, and henceforth all plants from Reunion are forbidden to enter her ports, and under these circumstances it will be wise to follow suit in India, where we have already quite enough of pests to cultivators. With seeds there can be no risk whatever,—the insects being much too large to be of spontaneous origin. It is said that this blight came here with plants from the Mauritius,

but until I go over there in person I will not vouch for the veracity of the assertion. It is much more probable that the not far distant land of Madagascar supplied this island with the orginal germs of disease. At present, every landowner is in trepidation and anxiety on the subject of its increase, which is undoubtedly very considerable and wide-spread."

---

*Communications on various subjects.*

The following papers were also submitted :—

1.—From Under-Secretary, Government of India, submitting copy of correspondence respecting the cultivation of Flax in the North-Western Provinces.

2.—From Captain Thomas Hutton, Mussoorie, offering a few remarks on Mr. Pringle's paper on the Tussur moth of Palamow, published in the *Journal*, (Vol. XI., Part iii.)

The above two communications were transferred for publication in the *Journal.*

3.—From H. Cope, Esq., dated 31st October, reporting on the successful result of the sowings of the seeds of field crops received from the Society :—

"I deem it desirable to mention, for the satisfaction of the Society and of the seedsmen who sent them out to your orders, that almost all the field crop seeds imported this season, and a share of which were obligingly sent to me, have germinated freely : the Flax seed *most* freely. It is the *first* time such has been the case within *my* experience of seven years, and shows that Flax seed *can* be imported in bulk in a germinating condition.

"It must be a subject of congratulation to the Society and to those members who have benefited by the measure, to have imported so large a supply of agricultural seeds in such a promising condition; and I entertain no doubt, that if the importations of the coming two or three years are equally successful, a very great amount of good must result to the country at large. I shall be thankful for any quantity of the seeds that you can spare me next year, and would suggest that the heavy parcels be made up in common country cotton bags, as paper is hardly strong enough. I should be too glad to pay for the expense."

The Secretary reported that the demand this season for all descriptions of the above seed had been greater than any previous year, with the exception of the flax seed, for which the demand had been comparatively limited; whereupon it was agreed to place a portion of the residue of this seed at Mr. Cope's disposal for trial as a *summer* crop.

4.—From R. W. Bingham, Esquire, dated 8th October, giving a few more particulars respecting the working of the American plough, and observations on the subject of cotton culture. The following are extracts from Mr. Bingham's letter regarding the plough :—

"You say in your note of the 20th September, that you are having frequent inquiries regarding the plough, since the publication of my remarks. I am really glad to hear it; and I am also receiving several letters of inquiry on the same subject. The plough still continues to give me as much satisfaction as at first; and I have now upwards of twenty applicants amongst the native zemindars around me who have seen its work, for one or two ploughs for their own use for the next year. I begin to think that its adoption will be a work of much less time amongst the better class of natives than I had at first anticipated. The object was to have an improved plough easily managed, and capable of being worked by a pair of good bullocks · now this plough can be so worked, and its one "chass" or ploughing is equal to four or six of the native plough. I shall have a number of them at work in my own farm in the ensuing year. I have sown indigo with it, as I told you, satisfactorily; since which I have sown the "Sea Island" Cotton you sent me, and shall soon sow oats, wheat, carrots, &c. I may, however, mention that Major Ottley, of the Ghazeepore Stud, used to use the more cumbrous English plough; and found *that* pay on the stud farm, while this plough does as much work, and fits more easily into native ideas than the English one, and a slight adaptation of the pole would make it even more easily usable by the natives with bullock draft. I have this improvement in my mind, but will not recommend it until I have tried it myself. No planter, however, will regret giving the plough a fair trial: and to save trouble in answering numberless applications, it may be as well to state that the plough used by me was made by the Messrs. Lackersteen, at the "Hope Foundry;" and I would advise all to try *one*; afterwards by getting only the *shares* from Calcutta; all the other parts of the plough could be made at home, and thus in making up a number of ploughs, the matter could be managed cheaply: that is the plan I shall in future adopt; and others will no doubt do the same. Of course. the first month's work must be sharply watched until the ploughmen get into the way, otherwise native indolence will raise obstacles in the way of its use, as they do in the way of every improvement."

5.—From Col. F. C. Burnett, Jullunder, dated 26th September, reporting successful progress in the culture of madder raised from the French seed supplied by the Society :—

"Many thanks for yours of the 18th instant, received yesterday, and for the instructions how to cultivate and prepare the madder. I am happy to be able to report still more favorably of its growth and thriving appearance. It has not only stood the hottest season that has been experienced in the Punjab for many years, but has flourished. I gathered a large supply of seed in the month of May, and now the plants are covered with a much larger stock of seed, which is gathered as it ripens. I have enough seed to sow about a beegah. I observe the paper you sent me says, that in July the plants wither. This has not been the case with me: they stopt growing for a short time after seeding, but the rains made them shoot out most luxuriantly. I am afraid the complicated process of preparing the Madder is too much for me to attempt; all I can do is to cultivate it."

6.—From H. Cope, Esquire, dated 24th October, an interesting communication respecting the progress of the public garden at Umritsur, with items of information regarding cotton, flax, imphee, madder, and putchuk:—

"I have to apologize for the unavoidable delay that has occurred in replying to several of your letters. The indifferent state of my health and the more urgent calls of an extending business must be my excuse. I will do my best to reply to all the points that require notice at once and without further delay.

"Public Garden.—I have, in the first place, to thank the Society and yourself on behalf of our Local Committee, who will, I hope, acknowledge their obligations in some official form, for the many really valuable contributions of seeds made to our Nursery Garden. You will be happy to hear that it is progressing favorably, and that many of the seeds we have received from your Society, are likely to form an era in the active culture of this part of the Punjab. The large supply of nuts of the *Terminalia Catappa* was most acceptable: many of them were in a germinating condition, owing to the careful way in which they were packed, and hundreds are above ground.

"Cotton.—The cotton plants from American, New Orleans, and Nankin seed, though necessarily few in number, are the admiration of the zemindars, and were pronounced by Mr. James Wightman, Manager, India Flax Company, who has been in Egypt, Mexico, and the United States, equal to any thing he had ever seen. They are loaded with bolls of the best shape, and the seed will, I hope, be available for distribution amongst the people.

"Imphee.—I may mention here that the white Imphee seed received from you proved a decided success as far as cultivation goes. All that came from other quarters, except a few seeds sent from Madras, and which I had by me

for some time, and a portion of a small supply received by Captain Farrington from Mooltan, proved a failure. Your seed was, however, sown so close, (on five beds when there was seed enough for an acre,) during my temporary absence, by the gardener, that it had not room to expand. Five rows in two large beds of this imphee are transplanted, and are now from nine to twelve feet high, showing fine heads, but are still much too close to admit of the full development of the stalks. These shall, however, be reserved for sugar. The produce of the other beds is being greedily eaten by the cattle.

"Your printer made a slight mistake in regard to the extent of this garden in a former communication. For *two*, he should have mentioned *ten* acres as the then extent of the garden. It is now upwards of *twelve*. The severe drought of more than nine weeks' duration, under which we are now suffering, has materially affected the prospects of the garden. Still it is doing well, and the small plots of vegetables I have sown are doing well in the new and vigorous soil. I am happy to say that almost all your seeds, both flower and vegetable, are doing well, while the field seeds are *most* valuable. The action of the Society supported by Government, in this respect, should be most valuable to your immediate neighbourhood.

"PUTCHUK.—You may remember my endeavour to show up the frauds of the Umritsur people in regard to '*Putchuck (koot)*, the exportable root of *Aucklandia veracosta*. I am happy to say that my letters on the subject have been attended with success to a certain extent, and that the rare admixture of cow-dung, &c., is discontinued. *Toot* [*Salvia lanata.*] (of which I have not yet been able to ascertain the botanical name, but which is found so close to Dhurmsala that I hope some day to be successful,) even is at a discount. The price fell in one week from five to three rupees per maund. If the Calcutta and Bombay exporters would but inform and refuse to export rubbish, the effect on the morale of our market would be very good.

"FRENCH MADDER.—You ask me about the French Madder seed. I sowed the supply you sent me, some time in February, in two large beds. It germinated freely, and flowered in July. About the end of August I obtained a good deal of seed, and examined some of the roots. They were of a good color, and thick, but as madder should, to become a merchantable article, remain three years in the ground, I dug up none. The plants are now covered with fine healthy young leaves, and looking very promising. I will send you some of the roots next year.

"FLAX.—With regard to your question about the Flax I prepared, and which you sent to Dundee, being prepared before or after the seed was

ripe, I have to remark, that in *no* case of flax preparation in this country within my knowledge, has the seed been sacrificed, though I feel assured that if the flax were prepared before the seed ripened, we should obtain even from a country crop such flax as would command a high price in England. I have already informed you that I had been asked to accompany Mr. Wightman to Sealkote. I did so; I introduced him to a large gathering of zemindars. Captain Winston, the Deputy Commissioner, assured him of every assistance, and took immediate steps for the necessary arrangements with the cultivators. I gave him *all* the information in my power, made over to him my small establishment, and heard from him with much satisfaction that the flax from acclimated seed I was then preparing was such as would command an excellent price at home. You will please to remember that the Association by which he has been sent out, never saw (nor did he) any flax from good seed. This company was formed, and their plans matured on the samples from country seed sent home by Mr. McLeod. If they can send out good seed in sufficient quantity, they will obtain such a return as will astonish them. As my occupation as a flax-grower has now, to a certain extent, ceased, I propose, if you think it will be acceptable, to send you a short paper for a future number of the Society's *Journal*, in continuation of my previous one "On the Introduction of Flax into the Punjab," bringing the subject up to date.

"The solitary flax stem I sent you some time ago, and which I believe I never wrote about, was from a bundle I received as a sample from a cultivator named Fuzulram, in Sealkote district. His field was on the roadside, and so remarkable for its appearance, that it attracted the attention of Sir Robert Montgomery, who was travelling that way, and stopped to examine it. I have since received the bulk of the crop, the whole of which I purchased, indeed, the man cultivated on my advances, and can safely say the sample brought me was a fair sample of his whole field, and what I sent you was the *shortest* of the bundle brought me."

7.—From Captain G. F. Vincent, Hongkong, 16th October, acknowledging receipt of, and returning his thanks for, the large supply of seeds sent for the proposed Soldiers' garden.

8.—From Under Secretary, Government of Bengal, requesting that another Wardian case of the China green dye plants may be prepared for the Government of Madras.

The Secretary stated that this requisition had been met.

---

*(Wednesday, the 19th December, 1860.)*

Dr. Thomas Thomson, President, in the chair.

The proceedings of the last General Meeting were read and confirmed, and the following gentlemen elected members:—

Capt. Woodcock, Messrs. H. C. Sutherland, C. S., T. A. Cleeve, W. Sowerby, and Colonel Hurry Bhukt.

The names of the following gentlemen were submitted as candidates for election:—

Dr. C. J. Jackson, Civil Surgeon, Chupra,—proposed by Mr. John Johnson, seconded by Dr. Thomson.

T. A. G. Palmer, Esq., Allahabad,—proposed by the Secretary, seconded by Mr. Cantor.

Arthur Anley, Esq., Beshpore, KishnahSur,—proposed by Mr. Cantor, seconded by the Secretary.

J. E. Maclachlan, Esq., Calcutta,—proposed by Mr. R. Blechynden, seconded by Mr. H. E. Braddon.

Secretary, Local Fund Committee, Ferozepore,—proposed by the Secretary, seconded by Mr. S. H. Robinson.

W. H. Lowe, Esq., Civil Service, Allahabad,—proposed by the Secretary, seconded by Mr. Cantor.

---

The following presentations were announced:—

1.—Report of the Bombay Chamber of Commerce for 1859-60. Presented by the Chamber.

2.—A few Orchids from Moulmein. Presented by C. B. Wood, Esq.

3.—A small sample of tea, grown and manufactured at Dacca from China stock.

Mr. Joseph Agabeg pronounces this tea to be very similar to the Munneepore tea and Ava tea. He states the Ava tea was once an article of trade to a certain extent, being brought here from Ava *viâ* Rangoon and sold to Affghans, who liked the tea above all others, and paid a good price for it. The tea in question was brought in form of balls, 7 or 8 inches in diameter, and approaching the Pouchong tea of China; the tea from Dacca Mr. Agabeg considers similar to the Oolong Pouchong, both before and after making. He is of opinion that it might be very much improved by greater care and attention in cultivation and in the mode of manufacturing; it has been badly manufactured, and tastes indifferently in consequence.

Ordered, that a copy of Mr. Agabeg's report be sent to Major Smith.

4.—A few excellent heads of Maize, equal to the original stock, raised at Hopetown, near Darjeeling, from American seed. Presented by F. Brine, Esq.

5. Two samples of cotton raised from exotic and indigenous seed in the jail garden at Purulia in Maunbhoom. Presented by Dr. Mouat.

"The vast superiority of the cotton raised from New Orleans Seed in fineness and length of staple over the other is manifest," observes Dr. Mouat. "Both have been subjected to exactly the same treatment in cultivation. The whole of this great tract of country, which is within easy reach of the railroad, appears to be well suited to the growth of cotton. Labor is plentiful, water for irrigation readily procurable at no great outlay, and if Mr. Oldham's valuable suggestion to open a communication by rail from the Raneegunge coal fields to Palamow and on to Jubbulpore be ever carried into effect, I am of opinion that the resources, vegetable and mineral, of this part of the country will be increased at least an hundredfold."

The cotton from foreign seed is considered of fair length, strength, and color, but not equal to the cotton raised by Mr. C. E. Blechynden from the same description of seed which was submitted at the last meeting.

6.—Samples of cotton, goor, dyed-cloth, mangrove bark, seeds, &c., from the Andamans. Presented by Captain J. C. Houghton, Superintendent of Port Blair.

Full particulars respecting the above specimens will be found in the body of the Proceedings.

7.—A further small supply of 4 lb. of French Madder seed, received by overland mail, through the friendly agency of James Cowell, Esq., was also placed on the table, accompanied by a note, of which the following is extract, and a copy of instructions for the culture of the root :—

"I hope the seed now received," writes Mr. Cowell, "will be acceptable to Colonel Burnett and other cultivators. I also send you the directions for the culture of the plant and preparation of the root, which, you will see, are extremely simple. I have no doubt Col. Burnett will be glad to have a copy of these instructions, and which will remove his fears about trouble in preparing the root for market. The French seedsman, you will observe, states that the root is gathered in the third year. This is the case in the South of France, but I believe that in Turkey (Smyrna), and even in the kingdom of Naples, where the madder is also cultivated, it is dug up in 18 months to two years, without prejudice to its coloring property. You will observe also that the plant, when in flower, should be cut to prevent its running to seed, which,

in such case, would diminish the size of the root. This fact should be brought to the notice of Indian cultivators."

The following is a translation of the instructions above referred to :—

CULTURE OF MADDER.

Light earth, good and fresh, well prepared and well pulverized.

The ground is divided into beds of about 3 feet and 2 feet, leaving one foot for a line of separation.

In March the seed is sown broadcast, or in furrows, at a distance of an inch and-a-half, *i. e.*, the seeds ; to keep the seed plots perfectly free from weeds they are weeded constantly for six months.

When the plants are in flower, they should be cut for forage, unless it is wished to leave them to seed.

The root is generally dug up in the third year, when it sometimes attains about a foot and-a-half in depth.

They are placed on a barn floor, where they are stirred by a pitchfork to remove the earth from them, after which they are dried in an airy and dry place, or in a stove.

One hundred and fifty pounds weight of seed is required for about 2½ square acres for the seed plots, as above.

Resolved, that the best thanks of the Society be tendered to Mr. Cowell, and the seed distributed on application.

---

The recommendation of the Council, of which notice was given at the last Meeting, to the effect that the Head Gardener's salary be increased to Rupees 200 per mensem from the commencement of his second year's term of service, was submitted, and agreed to.

*Nursery Garden.*

A report was read from the Gardener, enclosing a statement of the result of the sowings *in the open ground* of the pea seed, (English, American, and Cape,) and of the English flower seeds received during the year. Of the thirteen kinds of pea seed sown, five have germinated well, six indifferently, and two badly. Of sixty-one kinds of flower seeds, twenty-four have germinated well, seventeen indifferently, and twenty badly. The following is extract of Mr. McMeekin's report :—

" None of the pea seed, with the exception of two varieties, appeared to be first class, when I received them from you on the 3rd November. A great number never germinated, the reason of which is unknown to me. I might here mention that it is my opinion, that were pea seed soaked twelve hours in

water previous to sowing, this would be partially obviated. To ascertain this, I have sown seven lines on the 13th Instant, and will submit the result in due course, if required.

"Taking the flower seeds as a whole, they are inferior to last year's, but I am of opinion that more might be made of a great many of the tender varieties by sowing under cover, and then transplanting when the plants are strong enough for that operation. I am convinced that annuals in this country are improved by transplanting.

"By way of experiment I tried a new mode of raising annuals this year, which was most successful, a brief discription of which I beg to give.

"A bed 10 feet square and 4 inches deep was formed of prepared soil; round this, and an inch higher than the soil, was placed over an edging of wet clay or mud. In the inside of the edging was a trough for the purpose of laying the whole under water. In the bed the seed was sown, the trough filled with water, and then drained off, and the whole covered with two portable grass shades, which were removed an hour before sunrise and replaced an hour after sunrise. It only required irrigating once, and continued damp enough till the plants were ready. *Nemophila* and *Colinsia*, which I sowed in the open ground, did not come up at all. And under this cover the same sample of seed germinated as freely as mustard or cress.

"I may here mention that we have ready for distribution great varieties of both fruit and flower plants, including thirty plants of *Amherstia* and both kinds of *Mayena erecta*.

*Mode of cultivating Indigo in Shahabad.*

A communication on the above subject from Mr. R. W. Bingham was laid before the Meeting, of which the following are extracts :—

"Our system of planting Indigo is entirely different from that of Bengal, and is liked by the people. and answers our purposes tolerably well too. I cannot say how far the system would be applicable to Bengal,—all I know is, that it answers here, and we have, in consequence, very few Court cases.

"The tenure here in Shahabad is all the perpetual tenure, and the average proprietors vary from a two-annas share in one village to proprietorship of from ten to fifty villages. Some of the larger proprietors, such as the Rajah of Doomraon, &c., count their villages by hundreds, but this does not affect the general system, as the large proprietors invariably let their villages on lease, the extent of the lease varying from five to nine years; so that for practical purposes almost every village has its resident proprietor or lease-holder, with whom arrangements are made for Indigo

cultivation. We have no Assameewar cultivation, or so little as to be equivalent to none at all. It is therefore the custom to take plots of land in such villages as the proprietors or lease-holders may wish to let, and which lands may suit our purpose. Such plots vary in extent from twenty-five to one hundred beegahs (pucka). These arrangements are usually made from February to June, and are called one-year pottahs, though they really extend over fifteen months; and in the pottahs is a clause that we can keep the land for another year, if required, at a reduced, or perhaps for the same, rate. This is only done if the appearance of the plant is so good as to make it worth while to retain it. We never take the same land again for two years at least after our last Indigo crops have been taken from it. We will suppose now that the Factory *bundobust* for the year is made:—that is, the quantity of land obtained which we require for the season. We then wait eagerly for the rains, which in this district generally commence their fall from the 10th to the 30th June, and commence ploughing at once. I must premise that previously we have made over the plots to be sown in averages of fifty pucka beegahs to a peon, called with us a zilladar, who has charge of the sowing, weeding, and cutting of his own particular plot.

"The sowing has then commenced. Each zilladar peon receives advances for ploughs, under the supervision of the Factory amlah. The usual rate paid is four annas for each beegah ploughed. At this rate we have no difficulty whatever in getting a sufficient number of ploughs, and the amlah and zilladars cannot cheat the people much, as all the assamees know perfectly well the rate per plough; and if they are not paid, a falling off in the number of ploughs in that particular zillah is immediately observable, while other zilladars, who pay honestly, can obtain plenty. The remedy is easy. If the zilladar cannot get through his work, another is obtained who can, and thus the evil corrects itself. I have tried paying the ploughs from the Factory, but found it did not answer. Of course the assamees often try to cheat the zilladar by coming late to work, and so on; but these are minor evils. The greatest one is, assamees taking advances, and then working them out only at their own pleasure. This is a nuisance, but a little firmness generally brings them to their work, as they will not willingly often quarrel with the Factory. It is only a few pig-headed Zemindars, who have learnt a smattering of law, who sometimes, but rarely, attempt that, and then only when they know that the Magistrate is against the planters. If firmness does not bring the recusant to his work, we can take but little

further notice of the matter. He is sure to come again when his Mahajun presses him; and the Factories are almost the only places which pay ready money to assamees, and are the great stand-by to the Zemindars, who have not money to pay their revenue, as the Factory will always advance one year's rent on a plot of Indigo land, and have thus saved many villages from a Collector's sale.

"Well, we will suppose the ploughing has commenced on the 15th June, and hoeing about the same time. If we have a few heavy showers at first, all the sowings ought to be completed by the 15th July, when weeding should commence. From four to six ploughings, according to the land, is required for sowing; and about five seers per beegah is used. In the meantime the koontee of last year, if favourable rains have fallen, is growing rapidly, and it is usual to give it a ploughing to open the roots: but care must be taken only to do this when there is plenty of moisture falling. The koontee is ready for manufacture by the 25th July or 1st August. Manufacture is, I fancy, the same all over India. After the koontee is cut, such land as is not intended to be kept for telingah or *tirsallah,* is made over again to the proprietors, which, on such as is intended to be retained for another season, a further advance, is made. If rains are now favourable, much of this plant will be ready to cut again with the *Naodah,* or new plant, in September and October. Such as is not cut, stand over for seed. Very good land will give a fourth cutting with the koonteo of the next year. After the new plant is cut in September and October, it is carefully watched to prevent cattle grazing as that forms the koontee crop of the following year. This system you will observe is all *khoosh:* and the ryots like it. But they would like it much better if they could steal and eat the seed, but fortunately for us, Indigo seed is uneatable. As for damages for grazing, it is but seldom they are applied for, as the Courts would entail more trouble and expense than the damages are worth. We therefore protect our own plant, as the law cannot always do it. The Aheers are our great enemies: they will graze Indigo with their buffaloes. The common saying is, "If human flesh would make buffaloes fat, the Aheers would take care they should have it."

"There is a little *Jainowah,* or irrigation cultivation, in the hot weather, but irrigation is so hard to be come at, and so expensive, that it gives but a small item in the cultivation returns."

---

*Experiments at Agriculture in the Andamans.*

Read the following letter from Captain Houghton, Superintendent of

Port Blair, dated 7th November, forwarding the various specimens already referred to :—

"It may be of interest to record the result of our attempt at agriculture made with the seed supplied by the Society. I think it was in November last you were good enough to send me two large boxes of seed : a large portion of this was cotton seed. It was, I fear, sown too early, as it was all reported to have failed to germinate. Any cotton seed the Society may favor me with in future will either be sown under my own inspection, or re-distributed to Europeans only. In June I received a cask of the New Orleans Cotton seed through the Government from the Chamber of Commerce. It was sown in June and July, and vegetated freely; but that which was entrusted to natives of India was sown with other crops. The result has been that the plants have remained stunted and unproductive. The portion retained by myself was sown broadcast by a Chinese gardener within a stone's throw of the sea on the hill side. It did not vegetate as quickly as he expected. He therefore collected the seeds, and dibbled them into the soil. The result has been a healthy though not very extensive plot of plants, from two to four feet high. They are flowering freely, and promise an abundant crop. I suspect that the protracted duration of our rains has kept the flowers back. I send a small sample of its Kupas, also a sample of some raised by the natives last year from, most probably, Mexican seed. I have applied to Government for a fresh supply of the New Orleans seed, but shall feel obliged by a small supply of each variety available for experiment.

"The Imphee seed sent was divided out, one portion to natives and the other to Chinese gardeners. The latter reported that none of their seed vegetated: that, however, sown by the convicts on Atalanta Point and Viper Island germinated freely, and has yielded, and is still yielding, an abundant crop. It was all sown broadcast. It was ripe in many places by the first week in September, although the Indian Joowar, sown at the same time, is not ripe yet. I have made some goor from the grass, and send a sample. It seems poor stuff. I also send some of the seed, as you ought to have a large demand for it. I send a bottle of goor from cane, but the rains have rendered the canes too watery to admit of their producing a good article. A few weeks of sunshine will probably remedy this; but when our rains will leave is a problem I am unable to solve. Our last dry season only lasted six weeks.

"Tobacco thrives in spite of endless hordes of caterpillars, but I

have not succeeded in getting any properly cured yet. A West Indian is, however, going to try his hand on our present crop, and I have hopes of being able to send something that will bear inspection by-and-bye. The varieties of paddy obtained from Calcutta appear failures. All has been of necessity sown as a hill crop. We have abundance of straw and fine, promising ears, but they do not fill. The Tenasserim Rice, however, gives hope for an abundant harvest.

"We have recently made discoveries here which promise to be of value to future settlers. Captain Smith, Master of the *Lawrence Nairne* of Penang, informed me that the bark of the mangrove, abounding in these Islands, is highly valued by the Chinese for dyeing, and that the supply in the neighbourhood of the Straits is daily diminishing. I send you a cask of it, on which perhaps some competent person may be disposed to experimentalise. It is obtained without cost, having been stripped from posts cut for house-building. On its virtues being known, a convict set up as a dyer, and I hope to send some samples of cloth dyed here with this bark by him. The other discovery is the Niepa or Dunnee palm of the other coast and the Straits. I found one or two solitary plants of it about the harbor, and there are abundance of it on the head of a creek. It is this Palm that furnishes the "Attap" used along the Burmese coast in the Peninsula, and in the Archipelago, for thatching. It also produces toddy and goor, all of which products are largely consumed in Burmah. Seed had already been twice imported. We now know the exact situation where the plants may be best located, namely, where the shores of creeks are low, and the plant is liable to inundations of both fresh and salt water."

Captain Houghton closes his letter with an application for various kinds of useful seeds and plants.

Mr. S. H. Robinson kindly promised to examine and report on the quality of the *goor*. The cotton from the New Orleans seed was pronounced of fair quality, about equal to middling Orleans; that from the Petti Gulf seed is very indifferent, and has been dirtily picked.

---

*Flora and Economic products of Bourbon.*

A fourth communication on this subject, dated 28th September, from Capt. W. H. Lowther, was submitted. The following are extracts :—

"I commence a letter for you on the chance of finding an opportunity in a few days of sending it direct to Calcutta, with sundry seeds, &c., for our Society. I think I have succeeded in procuring a small quantity of

the celebrated Coffee, known here as *Café marron (C. Mauritiana)*, an arboreous variety, yielding the strongest berry in cultivation, and now nearly extinct, owing to the extensive destruction of every green thing to make room for sugar. It appears to prefer a mountainous region, and the kind of climate we possess in Chota Nagpoor, Lower Assam, &c. All other kinds in this Island are certainly not worth cultivating: the one most common is *C. Laurina (Cafe Leroi)*, a stunted bush, growing without shade, and yielding a very large quantity of small ill-looking berries, with a disagreeable woody flavour: in fact, it is only cultivated to supply the very great surplus demand among a population all fond of the beverage, and unable to meet with a better article.

"Latterly, I have been studying the culture of Vanilla for the benefit of our Society. This is the season of fecundation, and I have closely observed the operation, which is nothing more than gently lifting or transposing the sexual organs of the flowers, and without which very simple manipulation, they remain barren. These are a few notes in addition to my small memoranda attached to the pamphlet.

"1. Healthy plants in a vigorous state of growth attain one inch per diem:—a very simple index denoted 8 inches in the week. This was during warm showery weather.

"2. The roots of the Vanilla plant require frequent attention. It will be as well to surround them with some effective guard against heavy floods of rain, or injury from accidents, for on them not only depends the health, but the very life of the creeper, which is not exactly a parasite, or orchid, as most people suppose. These are the first symptoms of radical disturbance. The cultivators bend downwards the main stem, and peg it down as a layer, which soon strikes, and restores the health of the plant.

"3. A well-managed plantation of *one acre* being the enclosure of a small Villa in St. Denis, yielded to the family inhabiting it 15,000 *francs* last season (6,000 Rupees). Nothing can be more simple or inexpensive than this branch of cultivation, which is much followed as a profitable amusement by the ladies here.

"4. *Too much shade*, or *shade badly applied*, seems almost as prejudicial to a good crop, as the other extreme of exposure.

"5. No plant should be allowed to bear too freely; the quality and size of the pods suffer thereby. The pruning should be proportioned to the age and health of the creeper; no more than five or six pods are allowed to a single cluster. A plant of three or four years' growth has hundreds of

blossoms thereon, but no more than *half a pound* of dried produce should be taken from the same. The pruning should be performed after the pods are fairly set, as in fruit gardening.

"I have preserved some leaves of choice Vanilla from a friend's garden. I think the size of the same will astonish you. I shall also purchase a sample of the best pods in the market, the beauty of which will no doubt equally surprise you. I think there are many parts of India where we could compete with Bourbon, *viz.*, Chota Nagpoor, Lower and Central Assam, where, together with Cocoa and Coffee, Vanilla would be found exceedingly profitable. At present there are not many flowers in bloom, but the few to be found are magnificent. *Bougainvillea* requires to be seen *here* to be fully appreciated—it attains an immense size—gorgeously dazzling, and is a great favourite in the citizen retreats to cover arbours and summer-houses. *Petræa insignis* too is very fine, and far superior to the *Petræa volubilis* (the racemes being three times the size of the latter): but the gem of the gardens is *Brunsfelsia hopeana (Franciscea)*, brought here originally by Richard from Havannah. Picture to yourself a shrub 8 or 9 feet high,—a mass of Jessamine-scented flowers, fading from violet colour to snowy white. The odour is too overpowering for a room, but the shrub is the most beautiful thing I have yet seen here. It is now very common in Mauritius, and you should get Mr. Duncan to send it some day. Richard has just received an order to send all the *Sanseverias* he has on hand to Algiers. His new fibres have made a great stir among the *connoisseurs*, but he has promised to spare me a few plants for our Society. I am sending you a few seeds of the larger one *(S. macrophylla)*, and only hope they may germinate they *look* likely enough. The plants are hardy, tough-looking things. I will try and get them to you by a ship leaving very soon. I will also try and send that rare fine orchid *Angræcum superbum*, which should be grown on old rotten forest soil placed over the *roots* of some large tree; an old Banyan will do. The flowers are in long close spikes, white in colour, and scented like the Iris. The Loquot attains a large size in this Island, especially in the Mauritius, where it becomes a timber tree, yielding large juicy fruit, though not very well flavoured, owing to neglect. I think I told you that this Island would make the fortune of an industrious market gardener. Two small Cauliflowers *cost 4 Rupees* in the market, and the commonest herbs are dear and scarce. The seeds imported from France seem to be of a wretched kind, not to be compared to our *worst.* No Squashes or dainties of that sort, although it is the very best climate for them, and indeed

one might have vegetables of every kind all the year round, so varied are the temperatures to be found within a day's journey of the capital. The celebrated Roses are now in full bloom, and are *par excellence* the finest of our flowers. Richard tells me that Vanilla (the small leaved) is a Native of India (?) where it was found and described by the Naturalist Philibert, and he is going to find me chapter and verse: if this be *true*, then *India* should carry off the palm in quality and quantity of produce. I always thought Brazil the natural habitat of Vanilla, though in the wilds of Assam I was often struck forcibly with the idea that among the legions of orchideous parasites, it was curious I did not find Vanilla. There are many creepers closely resembling it, and travellers are easily led away to put down similitudes for realities. I will certainly prove M. Philibert's opinion on the *locale* asserted. Many of the Madagascar and Port Natal trees and plants in Richard's garden are now flowering, some for the *first time*. The beautiful order *Bignoniaceæ* is highly conspicuous, a *Millingtonia*, especially, laden with dark violet-coloured flowers appearing two or three times a year, and an unnamed specimen of the same order, giving a large terminal cyme of showy straw-coloured blossoms, before any appearance of foliage. A scarlet *Ruellia* from S. America is very pretty, and *Quassia amara* is a beautiful sight at a distance with its crimson sprays; of the *Cannas* a great variety, and of which I have sent you seeds: most of them are very superior to our Indian sorts, and well adapted for bouquets and vases. I have had a very fine species of *Amaryllis* from Zanzibar, given to me by an amateur, which I must try and get to you if possible. I had also two seedlings of *Carissa xylopseron*, given me by the same person, but I fear they are dead, from the sudden transition of climate. it is a shrub peculiar to an elevated region. Several days have elapsed since I was promised the Coffee seed from the interior, as also the seeds of any passion flowers ripening at this time, and which I saw in my friend's plantation almost wild among the Tea and Coffee."

In a subsequent portion of this letter, dated 7th October, Capt. Lowther announces that he has been disappointed in sending the plants above alluded to, and can therefore only transmit the box of samples and seeds *viâ* Mauritius. (These have not yet come to hand.)

---

A summary of replies from the Magistrates of certain districts, respecting the result of sowing of the vegetable seeds in Jail gardens, which were

supplied through the Society last year to the Inspector-General of Jails, Lower Provinces, was laid on the table, and ordered to be printed.

---

Read a letter from J. E. MacDonald, Esq., Secretary, Agri-Horticultural Society of Singapore, returning thanks for the Society's ready response of co-operation.

For all the above communications and presentations, the best thanks of the Society were accorded.

A. H. BLECHYNDEN,
*Secretary.*

# REPORT

OF THE

# Agricultural & Horticultural Society

# OF INDIA.

*Report from the Council to the Annual General Meeting of the 16th January, 1861.*

In submitting their Annual Report the Council have again to congratulate the Society on the large accession of Members during the past year. The elections have amounted to 123, a larger number than any previous year since the formation of the Society, excepting 1837, when the elections aggregated 148.

The following tabular statement, in continuation of previous years, shews the position of the Society in respect to Members on the 31st December, 1860:—

| Classification. | In 25 previous years. | In 1846. | In 1847. | In 1848. | In 1849. | In 1850. | In 1851. | In 1852. | In 1853. | In 1854. | In 1855. | In 1856. | In 1857. | In 1858. | In 1859. | In 1860. | Gross Total. | Total real number at close of 1860, after deducting lapses. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Honorary Members, .. .. | 11 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 1 | 0 | 18 | 11 |
| Associate Members, .. .. | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 |
| Corresponding Members, .. | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 4 |
| Civilians, .. .. .. .. | 232 | 13 | 15 | 22 | 8 | 10 | 22 | 16 | 18 | 6 | 23 | 23 | 17 | 19 | 28 | 28 | 500 | 194 |
| Merchants and Traders, .. .. | 201 | 14 | 12 | 13 | 10 | 14 | 20 | 12 | 5 | 16 | 18 | 31 | 11 | 20 | 15 | 18 | 430 | 140 |
| Indigo and other Tropical Agriculturists, .. .. .. | 190 | 15 | 6 | 5 | 1 | 9 | 19 | 13 | 10 | 7 | 14 | 12 | 10 | 14 | 20 | 15 | 360 | 128 |
| Military Officers, .. .. .. | 160 | 10 | 11 | 11 | 11 | 9 | 34 | 18 | 22 | 19 | 26 | 22 | 12 | 14 | 27 | 38 | 444 | 169 |
| Medical Officers, .. .. .. | 80 | 0 | 2 | 3 | 5 | 7 | 4 | 5 | 3 | 4 | 6 | 9 | 3 | 3 | 16 | 11 | 161 | 51 |
| Asiatics, .. .. .. .. | 63 | 2 | 14 | 5 | 6 | 9 | 8 | 8 | 8 | 5 | 5 | 7 | 14 | 19 | 4 | 6 | 183 | 67 |
| Clergy, .. .. .. .. | 14 | 1 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 0 | 0 | 1 | 27 | 8 |
| Law Officers, .. .. .. | 40 | 1 | 0 | 0 | 6 | 4 | 6 | 3 | 1 | 3 | 6 | 2 | 1 | 5 | 2 | 1 | 81 | 21 |
| Miscellaneous, .. .. .. | 9 | 0 | 2 | 0 | 2 | 2 | 6 | 0 | 0 | 10 | 0 | 0 | 2 | 7 | 5 | 5 | 50 | 35 |
| | 1,002 | 58 | 62 | 60 | 49 | 67 | 122 | 78 | 69 | 72 | 100 | 109 | 72 | 102 | 118 | 123 | 2,263 | 830 |

The lapses alluded to in the last column, comprises 13* deaths, 39 resignations, 2 whose names have been removed from the list, their subscriptions being irrecoverable, and 19 whose names have been taken off the list in accordance with section 6 chapter III of the Bye-Laws, their absence from India having extended beyond 4 years,—amounting in all to 73.

Of the total number (830) introduced in the last column, 33 have compounded for their subscriptions, 113 are absent from India, and 17 are Honorary, Associate, and Corresponding; in all 163:—leaving 667 as the actual number of paying members at the close of the year, or an increase of 55 on the year 1859.

The financial position of the Society is much the same as last year. It will be seen from the annexed statement that the total receipts, including the cash balance, at the close of 1859, have been Rs. 32,126, and the disbursements Rs. 31,743-8-4 leaving a balance in the Bank of Bengal and in the hands of the Secretary of Rs. 382 11-11. The liabilities amount to Rs. 12,150, and the dependencies to Rs. 9,827-13-3, exclusive of the amount invested in Government Securities of Rs. 20,333-5-4. The Council regret to observe that the arrears of subscription are still comparatively heavy, notwithstanding that the rule on this point (Section 5 of Chapter V.) was made more stringent in the early part of the year. They hope that the Members generally will aid the Executive in their endeavors to reduce this balance considerably during the coming year.

Two exhibitions only were held last year, and those in the Town Hall instead of the Auckland Garden, in consequence of tents not being available. The show in January was about the best hitherto held in respect to horticultural produce; the floral department was not, however, an improvement on 1859 or 1858. The same remark is applicable to the show of February. The usual third show did not take place in consequence of the unfavorable

* Dr. D. Mc. L. Falconer; Baboo Ramrutton Roy, Messrs. W. Duff; N. C. Tuckerman; J. W. Carter; T. B. Mactier, C. S.; Dr. T. Cantor; Messrs. O. J. Elias; R. Main; E. H. O'Brien; S. Lushington, C. S.; W. F. Gilmore and James Small.

nature of the season. The amount distributed in prizes was Rs. 753.

The importations of vegetable and flower seeds, have not proved equal to last year; the flower seeds, especially, have very generally failed, causing considerable disappointment. This circumstance has been brought to the notice of the seedsmen, who have been instructed to take precautionary measures to avoid a recurrence of such failure. The consignment of field crop seeds has turned out well, so far as the reports that have reached the Society to the present time enable a judgment to be formed. Fuller reports will probably be received during 1861 of the general result. The distribution has been more general than in former years. The small supply of French madder seed, received in the early part of the year, has germinated well, and the reports from various parts of the country in respect to its culture are so encouraging that another supply was ordered through the friendly agency of Mr. James Cowell, and has just come to hand. Various public gardens throughout the country have been supplied with seeds of all sorts, as also the newly formed soldier's garden at Hongkong, the recently established Agricultural and Horticultural Society at Singapore and the convict settlement at Port Blair.

It is gratifying to add that the Secretary of State for India, has not allowed the new customs Tariff to interfere with the privilege hitherto granted to the Society of receiving their annual consignments of seeds free of duty.

Several alterations have been made during the past year in the Garden. To meet the greatly increasing demand for ornamental plants it has been found necessary to add on the west side to that portion of the ground appropriated to the flower garden. On this newly laid out spot a small tank has been excavated with walks round it. A substantial Veranda of brick work has been added to the south side of the Gardener's house. Nearly all the old roads have been remetalled, and several new roads laid down to the extent of 30,000 superficial feet; some 14 feet and others 12, 11 and 8 feet in width.

The demand for plants has been steady. Between 14 and 15 thousand have been distributed, ornamental and economic; in the latter are comprised 3,033 fruit trees. Besides these a quantity of sugar canes, tapioca and Rheea cuttings have been sent out, tubers of arrowroot and yams; also Vanilla, coffee and China green dye plants. The number of applicants during the year have been 150; 26 glazed cases have also been given and ten more are about to be exported.

Among other subjects that have been before the Society, cotton, flax, and silk have particularly engaged attention during the past twelve months. The Society have awarded a prize of 1,000 Rupees and their gold medal to Messrs. Fischer & Co. of Salem for the best specimen of cotton raised from foreign seed. They have been in active correspondence with the Manchester Cotton Supply Association. The Association have sent out gins of a superior description, they have also placed two gold and six silver medals at the disposal of the Society with the view of assisting to encourage the cultivation of cotton. The culture of flax for the sake of its fibre, is continuing to excite attention, especially in the North-Western Provinces and the Punjaub. A Company has been recently formed in Belfast for the growth and manufacture of this important staple in India, commencing with the Punjaub. The Company has already commenced active operations with a fair prospect of success.

The Society have received several communications and specimens respecting silk, wild and cultivated, in continuation of those submitted last year, including an interesting account from Mr. Cope of his experimental operations at Umritsur for the culture of the mulberry worm.

Allusion was made in the last report to the efforts of Her Majesty's Government towards the introduction of the quinine-yielding Cinchonas into India, and the deputation of a confidential officer to South America with this object in view. The Society have received the result of Mr. Markham's deputation in the shape of a rather

lengthy and interesting report which will be found published in full in the Proceedings for October.

It may here be mentioned that the Society's prize of Rs. 500 for an efficient substitute for Europe Box for engraving purposes, to which reference was made in a previous report, has been awarded to Captain W. E. Hay of the Bengal Army for the logs of Himalayan Box which he sent down in 1857. The Society have also awarded a similar prize to Mr. George Jephson of Simla for the valuable information communicated by him, and for the expence and trouble incurred by him in consequence of the Society's second reference on this subject.

The Council have lastly, to add that two Numbers of the Journal, Parts 2 and 3 of Vol. XI have been published during the year, in which will be found several interesting papers on Silk, Cotton, Himalayan Box wood, timbers, various horticultural subjects, and an useful contribution respecting the advantages resulting from the formation of Canals in certain parts of Behar and the North-Western Provinces.

---

*Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December,* 1860.

## RECEIPTS.

| | Rs. | As. | P. | Rs. | As. | P. |
|---|---|---|---|---|---|---|
| From Members, Subscriptions collected during the year, ... ... Co.'s Rs. | | | | 20,218 | 4 | 9 |
| ,, Government Annual Donation, ... ... ... ... ... | 5,000 | 0 | 0 | | | |
| ,, The Right Honorable Earl Canning's annual donation for the year 1860, ... ... ... ... ... ... ... | 500 | 0 | 0 | | | |
| ,, Collector of Customs refund of the amount of duty paid on seeds imported in 1859, ... ... ... ... ... | 835 | 2 | 6 | | | |
| ,, Government for Cape vegetable seeds for Jail Gardens, ... | 500 | 0 | 0 | | | |
| ,, Ditto, for American vegetable seeds for Jail Gardens, ... | 310 | 0 | 0 | | | |
| | | | | 7,145 | 2 | 6 |
| ,, Accruings of interest on Government Notes, ... ... ... ... ... | | | | 813 | 5 | 4 |
| ,, Proceeds of Sugar-cane delivered from the Nursery Garden, | 20 | 11 | 0 | | | |
| ,, Ditto, of a Plough for Jail Garden L. P, ... ... ... | 25 | 0 | 0 | | | |
| ,, Ditto, fruit grafts from the Nursery Garden, ... ... ... | 755 | 1 | 3 | | | |
| ,, Ditto, of a portion of surplus Cape American and Native vegetable and English flower seeds of 1859-60, ... ... | 809 | 1 | 6 | | | |
| ,, Ditto, of copies of publications of Society, ... ... ... | 166 | 2 | 0 | | | |
| ,, Ditto, of sale of old seed boxes, ... ... ... ... ... | 8 | 0 | 0 | | | |
| ,, Ditto, of sale of surplus stock of garden tools, ... ... | 37 | 0 | 9 | | | |
| ,, Members, amount for glazed cases, pots, and packing charges for seeds, &c., ... ... ... ... ... ... ... | 798 | 8 | 3 | | | |
| ,, Ditto, amount repaid for freight on boxes of seeds forwarded in 1859-60, ... ... ... ... ... ... ... | 59 | 8 | 0 | | | |
| ,, Amount of Coolies wages refunded by Head Gardener, ... | 8 | 0 | 9 | | | |
| | | | | 2,681 | 12 | 6 |
| Total Receipts Rs., ... ... | | | | 30,858 | 9 | 1 |
| By Balance in the Bank of Bengal on 31st December, 1859, ... | 1,253 | 7 | 5 | | | |
| ,, ditto in the hands of the Secretary on ditto, ... ... | 14 | 3 | 9 | | | |
| | | | | 1,267 | 11 | 2 |
| Grand Total, Co.'s Rs., ... | | | | 32,126 | 4 | 3 |

## DISBURSEMENTS.

| | Rs. | As. | P. |
|---|---|---|---|
| By Messrs. C. M. Villet & Son for Cape vegetable seeds supplied in 1860, ... ... ... ... ... ... ... ... | 2,157 | 0 | 0 |
| ,, Ditto, for ditto for Jail Gardens in 1860, ... ... ... ... | 432 | 0 | 0 |
| ,, Messrs D. Landreth and Son for American Garden seeds, supplied in 1858-59, ... ... ... ... ... ... | 2,000 | 0 | 0 |
| ,, Messrs. James Carter and Co. in full of their bills, amounting to £404 9-4 for English flower and field crop seeds, supplied in 1859, ... ... ... ... ... ... ... ... | 4,002 | 14 | 8 |
| Carried over, Co.'s Rs., ... | 8,591 | 14 | 8 |

| | | |
|---|---|---|
| Brought forward, Co.'s Rs., ... | 8,591 14 8 | |
| By Dr. Thomson for English flower seeds in 1859, ... ... ... | 8 8 0 | |
| ,, James Cowell, Esq., for Madder seed, ... ... ... ... | 12 10 6 | |
| ,, Messrs. D. Wilson and Co., for English vegetable seeds, ... | 60 0 0 | |
| ,, Mr. James Templeman, in full for Cape seeds supplied in 1858, ... .. .. . ... ... ... ... ... | 25 8 4 | |
| ,, Messrs. Thomas Gibbs and Co. for Agricultural Seeds supplied in 1858, ... .. ... .. ... ... ... ... | 714 14 3 | |
| ,, D. Maxwell Esq., for Cauliflower seed, ... ... ... ... | 16 0 0 | |
| | | 9,429 7 9 |
| **LIBRARY.** | | |
| ,, Books purchased during the year for the Library, ... ... | 345 6 0 | |
| ,, Binding books during the year, .. ... ... .. ... | 8 0 0 | |
| | | 353 6 0 |
| **PRINTING.** | | |
| ,, Sundry parties for printing receipts and schedule of prizes for flower shows, &c., &c., . .. ... ... ... ... ... ... | | 64 7 6 |
| **JOURNAL.** | | |
| ,, Bishop's College Press, for printing, &c., 700 copies of *Journal* Parts 1, 2 and 3, Vol XI, ... ... ... ... ... ... | 1,575 0 9 | |
| ,, Calcutta Printing and Publishing Press, for Printing Appendix to the above, ... .. .. .. .. ... | 305 4 0 | |
| | | 1,880 4 9 |
| **NURSERY GARDEN.** | | |
| ,, Ordinary expences incurred on account of the Nursery Garden from 1st December, 1859, to 30th November, 1860, .. ... | 4,206 7 0 | |
| ,, Extra ditto, for purchase of fruit seedlings for grafting, for glazed cases, pots, for making new roads, widening and repairing old roads, for building a pucka verandah to Gardener's house and for sundry other contingent expences, | 1,868 14 7 | |
| ,, James Carter, and Co. in full of their bill for Garden Tools, .. | 466 4 8 | |
| | | 6,541 10 3 |
| **ESTABLISHMENT.** | | |
| ,, Amount for establishment from 1st December, 1859, to 30th November, 1860, .. . .. .. .. ... . ... ... | | 8,875 4 0 |
| **PLOUGH.** | | |
| ,, Messrs. G. F Lackersteen and Co. for American Ploughs, ... ... ... | | 50 0 0 |
| **PECUNIARY REWARDS.** | | |
| ,, Prizes to Mallees for vegetables and fruits at exhibitions held on the 26th January, and 29th February, 1860, ... ... ... | 547 0 0 | |
| ,, Ditto to ditto, for flowers at ditto, ditto, ... ... ... ... | 206 0 0 | |
| | | 753 0 0 |
| **ADVERTISEMENTS.** | | |
| ,, Advertising notices of general meetings, of shows of vegetables and flowers, distribution of seeds, ... ... ... ... ... ... | | 151 15 0 |
| **STATIONERY.** | | |
| ,, Stationery for office books, &c., for the use of the office, ... | 91 0 0 | |
| ,, Brown packing paper for packing seeds, ... ... ... ... | 93 0 0 | |
| | | 184 0 0 |
| Carried over, Co.'s Rs., .. | | 28,283 7 3 |

| | Rs. | A. | P. | Rs. | A. | P. |
|---|---|---|---|---|---|---|
| Brought forward, Co.'s Rs., ... | | | | 28,283 | 7 | 3 |
| **Freight.** | | | | | | |
| By Freight on boxes of seeds, books, &c., sent and received from the Cape of Good Hope, America, &c., ... ... ... ... ... ... | | | | 374 | 5 | 9 |
| **Metcalfe Hall.** | | | | | | |
| ,, Society's proportion of assessment on the Metcalfe Hall from October, 1859, to September, 1860, ... ... ... ... | 157 | 8 | 0 | | | |
| ,, Ditto of ditto for lighting tax from October, 1859, to Sept., 1860, | 42 | 0 | 0 | | | |
| ,, Modosuden Roy for Society's proportion for inspecting and looking over the Metcalfe Hall Building from April, 1859, to March, 1860, ... ... ... ... ... ... ... | 28 | 14 | 0 | | | |
| | | | | 228 | 6 | 0 |
| **Furniture.** | | | | | | |
| ,, Sundry articles of furniture, ... ... ... ... ... ... .. | | | | 51 | 0 | 0 |
| **Prizes.** | | | | | | |
| ,, Mr. George Jophson for prize awarded for the expence and trouble incurred by him on account Himalayan box wood as per resolution of June meeting, ... ... ... ... | 500 | 0 | 0 | | | |
| ,, Messrs. Fischer & Co., for prize awarded for cotton, ... ... | 1,000 | 0 | 0 | | | |
| | | | | 1,500 | 0 | 0 |
| **Medals.** | | | | | | |
| ,, Messrs. Charles Nephews and Co. for two Gold Medals &c., ... ... ... | | | | 312 | 12 | 0 |
| **Petty Charges.** | | | | | | |
| ,, Sundry charges, including postage on letters, &c., sent and received, and for copies of the *Journal*, ... ... ... | 686 | 10 | 0 | | | |
| ,, Extra writer and packermen for sub-dividing and writing on seed papers for soldering tin boxes and lining wooden boxes with tin, sent to non-resident Members, and for other petty charges, ... ... ... ... ... ... ... ... | 208 | 12 | 9 | | | |
| ,, Presents to Constables for attending at Horticultural and Floricultural Exhibitions during the year, ... ... ... | 48 | 0 | 0 | | | |
| ,, Messrs. Grindlay and Co., being balance due to them as per account dated 31st, December 1859, ... ... ... ... | 29 | 3 | 3 | | | |
| ,, Secretary Bank of Bengal for renewing notes, and for fees and commission, ... ... ... ... ... ... ... ... | 5 | 0 | 0 | | | |
| ,, Government for income tax on interest on Government Securities, | 15 | 15 | 4 | | | |
| | | | | 993 | 8 | 4 |
| Total Disbursements, Co.'s Rs., ... | | | | 31,743 | 8 | 4 |
| By Balance in the Bank of Bengal on 31st December, 1860, ... | 380 | 2 | 2 | | | |
| ,, Ditto in the hands of the Secretary on ditto, ... ... ... | 2 | 9 | 9 | | | |
| | | | | 382 | 11 | 11 |
| Grand Total, Co.'s Rs., ... | | | | 32,126 | 4 | 3 |

# MEMORANDUM

## Disbursements.

| | | | | | | |
|---|---|---|---|---|---|---|
| To amount of disbursements during the year 1860, as per statement, ... ... ... | | | | 31,743 | 8 | 4 |
| ,, Balance in the Bank of Bengal on 31st December, 1860, ... ... ... ... | 380 | 2 | 2 | | | |
| ,, Ditto in the hands of Secretary on ditto, ... | 2 | 9 | 9 | | | |
| | | | | 382 | 11 | 11 |
| Total, Co.'s Rupees, | | | | 32,126 | 4 | 3 |

## Receipts.

| | | | | | | |
|---|---|---|---|---|---|---|
| To amount of receipts during the year 1860, as per Statement, ... ... ... | | | | 30,858 | 9 | 1 |
| ,, Balance in the Bank of Bengal on 31st December, 1859, ... ... ... | 1,253 | 7 | 5 | | | |
| ,, Ditto in the hands of the Secretary on ditto, ... | 14 | 9 | 3 | | | |
| | | | | 1,267 | 11 | 2 |
| Total, Co.'s Rupees, | | | | 32,126 | 4 | 3 |

## Liabilities.

| | | | | | | |
|---|---|---|---|---|---|---|
| Amount due by the Society for American seeds of 1859-60, ... ... ... ... ... ... | 8,000 | 0 | 0 | | | |
| Ditto for Agricultural seeds of 1860, ... ... | 1,600 | 0 | 0 | | | |
| Ditto for English flower seeds of 1860, ... ... | 2,550 | 0 | 0 | | | |
| | | | | 12,150 | 0 | 0 |

## Dependencies.

| | | | | | | |
|---|---|---|---|---|---|---|
| Amount invested in Government Securities lodged in the Bank of Bengal, ... ... ... ... | | | | 20,333 | 5 | 4 |
| Ditto of Subscription in arrear, ... ... ... | 8,259 | 8 | 3 | | | |
| Ditto outstandings for seeds, grafts, copies of *Journal*, &c., &c., ... ... ... ... | 1,568 | 5 | 0 | | | |
| | | | | 9,827 | 13 | 3 |

LIST OF MEMBERS

OF THE

# Agricultural & Horticultural Society

OF

# INDIA.

---

*DECEMBER 31st*, 1860.

---

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

## OFFICE-BEARERS.

### President:

DR. THOMAS THOMSON.

### Vice-Presidents:

C. A. CANTOR, ESQ.
RAJAH PERTAUP CHUNDER SING, BAHADOOR.
A. GROTE, ESQ.
BABOO PEARY CHAND MITTRA.

### Secretary and Treasurer:

A. H. BLECHYNDEN, ESQ.

### Members of Council:

BABOO SHIB CHUNDER DEB.
S. P. GRIFFITHS, ESQ.
BABOO RAMGOPAL GHOSE.
REV. JAMES LONG.
S. H. ROBINSON, ESQ.
C. B. WOOD, ESQ.
DR. F. J. MOUAT.
W. G. ROSE, ESQ.
BABOO GOBIND CHUNDER SEN.
E. PRESTWICH, ESQ.
T. E. CARTER, ESQ.
DR. J. B. BARRY,

## Patron:

THE RIGHT HONORABLE EARL CANNING, G. C. B.

VICEROY AND GOVERNOR-GENERAL OF INDIA, ETC., ETC., ETC.

## List of Members.

* This Mark denotes Members who have compounded for their Annual Subscriptions.

† This Mark denotes Members who are absent from India, and therefore Non-contributors.

‡ This Mark denotes Members who, though absent, are desirous of continuing their Subscriptions.

### HONORARY MEMBERS.

| | | |
|---|---|---|
| The Right Honorable Sir Edward Ryan, A. M., F.A.S., London, | 1828 | 1841 |
| Charles Huffnagle, Esq., M. D., | | 1837 |
| Colonel John Colvin, C.B., London, | | 1830 |
| J. Mackay, Esq., | | |
| Don Ramon de la Sagra, Island of Cuba, | | |
| Dr. Justus Liebig, Professor of Chemistry in the University of Giessen, | | 1843 |
| James Hume, Esq., Magistrate, Calcutta, | 1839 | 1848 |
| Lt.-Col. Francis Jenkins, Commissioner of Assam, | 1828 | 1852 |
| The Right Honorable Sir Lawrence Peel, London, | 1842 | 1856 |
| R. Fortune, Esq., China, | | 1856 |
| Sir Arthur Buller, | 1849 | 1859 |

### CORRESPONDING MEMBERS.

| | |
|---|---|
| D. J. Macgowan, Esq., M.D., Ningpo, | 1851 |
| Dr. J. V. Thompson, Sydney, | 1840 |
| Dr. R. Riddell, London, | 1853 |
| Mons. Natalis Rondot, Paris, | 1858 |

### ASSOCIATE MEMBERS.

| | |
|---|---|
| Mr. Robert Scott, Head-Gardener, H. C. Botanic Garden, Calcutta, | 1851 |
| Capt. E. P. Nisbet, London, | 1843 |

# ORDINARY MEMBERS.

Admitted

ABBOTT, Horace, Esq., Sampore Factory, Surdah, .. .. 1858
Abbott, Col. P. Indian Army, Mussorree, .. .. 1860
Abbott, Col. S. A., Lucknow, .. .. . .. 1860
Abdool Gunny, Kajee, Zemindar, Dacca, .. .. .. 1860
Ackland, C. J., Esq., Calcutta, .. .. .. .. .. 1855
Ackland, George, Esq., Merchant, Calcutta, .. .. 1853
Aga Syud Hossein Shoostree, Merchant, Calcutta, .. .. 1857
Agabeg, J. Esq., Merchant, Calcutta, .. .. .. 1854
Agabeg, M. Esq., Merchant, Rangoon, .. .. .. 1858
Agabeg, A. L., Esq., Calcutta, .. .. .. .. 1860
Ahmuty, R. Esq., Supt. Govt. Estates, Mymensing, .. 1858
Ainslie, W. Esq., Civil service, .. .. .. .. 1847
Alexander,† Henry, Esq., Civil service, .. .. .. 1846
Alexander,† H. A. R., Esq., Civil service, .. .. .. 1855
Alexander, Capt. F., Artillery, Meerut, .. .. .. 1860
Allardice,† Geo., Esq., .. .. .. .. .. 1854
Allan, Dr. James, Civil Surgeon, Gowhatti, . .. .. 1858
Allen,† J. H., Esq., Merchant, .. .. .. .. 1850
Allen, W. J., Esq., Civil service, Calcutta, .. .. .. 1850
Allen, Cap. A., (late, 55th N. I.,) Roorkee, .. .. 1860
Allowallea,* Rajah of Kapoorthullea, Jullunder, .. .. 1853
Anderson, P. Esq., Merchant, Calcutta, .. .. .. 1854
Anderson, Major, W. W., (1st Bombay Lancers) Supdt. H. H., the Guicowar's Contingent of Horse, Rajkote, Kattywar, .. .. .. .. .. .. .. 1859
Anderson, William, Esq., Merchant, Calcutta, .. .. 1860
Andrew, David, Esq., Indigo planter, Aurungabad, . .. 1851
Andrew, H. Esq. Civil Engineer, Dinapore, .. .. .. 1860
Angelo, Elliot, Esq., Merchant, Calcutta, .. .. .. 1859
Anneslcy, Capt. R. M. S., (Meywar Bheel Corps,) Karwarah, Meywar, . .. .. .. .. .. 1858
Armstrong, C. M., Esq., Opium Dept., Gya, .. . 1858
Atherton, H. Esq., Dhurmsala, Punjab, .. .. .. 1845
Augier, P. Esq., Calcutta Mint, .. .. .. .. 1858
Auld,† S. J., Esq., .. .. .. .. .. .. 1846

BADGLEY, Lieut. W. F., 18th Punjab Infy. Moradabad, .. 1860
Balfour, G. G., Esq., Civil service, Sylhet, .. .. .. 1844
Balfour, Lewis, Esq., Merchant, Calcutta, .. .. .. 1842
Barnes, C. H., Esq., Colgong, .. .. .. .. .. 1858
Barrow, Col. L., C. B., Oude, .. .. .. .. 1859
Barry, Dr. J. R., Calcutta, .. .. .. .. .. 1856
Barry, G. R., Esq., Serajgunge, .. .. .. .. 1849
Barry, Thomas H., Esq., Merchant, Calcutta, .. .. 1856
Battersby, Arthur, Esq., Indigo-planter, Babukansi, Joynagore, . .. .. .. .. .. .. 1855
Baugh, Capt. F. W. (26th N. I.,) .. .. .. .. 1855

| | Admitted. |
|---|---|
| Bax, J. H., Esq. Civil service, Ghazeepore, . .. .. .. | 1855 |
| Bayley, H. V., Esq., Civil service, Calcutta, .. .. | 1855 |
| Bayley, Stuart Colvin, Esq., Civil service, Patna, .. .. | 1859 |
| Beadon, Honble. C. Civil service, Calcutta, .. .. .. | 1855 |
| Bean, Capt. John, Cantonment Magistrate, Rawul Pindee, | 1859 |
| Bean, J. Esq., Sub-Deputy Opium Agent, Monghyr, .. | 1850 |
| Beaufort, Francis L., Esq., Civil service, Calcutta, .. .. | 1838 |
| Becher, William, Esq., Gowhatti, .. .. .. .. | 1855 |
| Beddy, H. W., Esq., Principal Assist. Commissioner of Sandoway, .. .. .. .. .. .. .. | 1855 |
| Begbie,† C. N. W., Esq., Merchant, .. .. .. | 1854 |
| Begg,‡ Dr. D., .. .. .. .. .. .. | 1850 |
| Bell, J. D., Esq., Barrister-at-law, Calcutta, .. .. | 1855 |
| Bennet, T. B., Esq., Indigo-planter, Purneah, .. .. | 1854 |
| Bennett, T. H., Esq., Merchant, Calcutta, .. .. .. | 1857 |
| Bentall,*† Edward, Esq., Civil service, .. . .. | 1837 |
| Berkeley, L., Esq., Officiating Sudder Ameen, Delhi, .. | 1855 |
| Berkeley, R., Esq., Assist.-Commissioner, Mulaon, .. | 1857 |
| Berrill, W., Esq., Allahabad, .. .. .. .. | 1857 |
| Bhukt, Col. Hurry, Nepalese Ambassador, Calcutta, .. | 1860 |
| Bindabun, Chuder Mittra, Baboo, Calcutta, . .. .. | 1853 |
| Bingham, R. W., Esq., Chynepore, near Sasseram, . | 1859 |
| Birch, Major-General, Sir R. J. H., C. B., Secretary to Government, Military Department, Calcutta, .. .. | 1841 |
| Birch, Capt. R. C., Senior Assist-Comr. Chota Nagpore, .. | 1858 |
| Birney,† Lieut. J., Bengal Engineers, . .. .. | 1859 |
| Bishop,* Major H. P., (Artillery,) Bareilly, .. .. | 1853 |
| Bissumbhur Sing, Baboo, Zemindar, Soorool, .. .. | 1857 |
| Blacker, G. M., Esq., Merchant, Calcutta, .. .. .. | 1856 |
| Blake, Major H. W., Comg. Pegu Police Battn., Rangoon,.. | 1858 |
| Blechynden, R., Esq., Merchant, Calcutta, .. .. .. | 1854 |
| Blechynden, A. H., Esq., Secy. Agri-Horticultural Socy. of India, Calcutta, .. .. .. .. .. | 1851 |
| Blyth,† Philip, Esq., Merchant, .. .. .. .. | 1857 |
| Boaz,† Rev. Dr. T., .. .. .. .. .. .. | 1854 |
| Bobily, Rajah of, Vizagapatam, .. .. .. .. | 1860 |
| Boileau, Major, G. W., Comdt. Oude Military Police, Seetapore, .. .. .. .. .. .. .. | 1859 |
| Boldero, E. J., Esq., Civil service, Mynporie, .. .. | 1860 |
| Bonavia, E., Esq., M. D., Assist.-Surgeon, Lucknow, .. | 1859 |
| Bourne, Walter, Esq., M. D., Calcutta, .. .. .. | 1859 |
| Bourne, Walter, Esq., Resident Engineer, E. I. Railway, Monghyr, .. .. .. .. .. .. .. | 1855 |
| Bowers, J. F., Esq., Indigo-planter, Purneah, .. .. | 1851 |
| Bracken, Capt., R. D' O. C., 2nd in Command 2nd Seik Local Regt. Punjab, .. .. .. .. .. | 1860 |
| Braddon, E. N. C. Esq., Assist-Commissioner, Sonthal Pergunnahs, Deoghur, .. .. .. .. .. | 1858 |

Admitted.

Braddon, Henry, Edward Esq., Merchant, Calcutta, .. 1860
Brae, T., Esq., Indigo-planter, Hatberria, Jessore, .. 1854
Brandis, Dr., D. Supt. of Forests, Rangoon, .. 1857
Brice, N. Esq., Dinapore, .. .. .. .. .. 1859
Bridgman, J. H. Esq., Indigo-planter, Gorruckpore, .. 1856
Brine, Frederick, Esq., Darjeeling, .. .. .. .. 1857
Bristow, Capt. J. W., (19th N. I.), Depy.-Comr., Mozufferghur, Punjab, .. .. .. .. .. 1855
Brodhurst, M. Esq., Civil service, Saharunpore, .. . 1859
Brodie,*† Major T.,.. .. .. .. .. .. 1836
Bronche, W. J., Esq., Indigo-planter, Dheree, .. .. 1859
Brooke, Major John C., (63rd N. I.) Commandant Meywar Bheel Corps, and Assistant Political Agent in Meywar, Neemuch, .. .. .. .. .. .. .. 1843
Brownlow, Lieut. H. A., (Engineers,) Supt. Eastern Jumna Canals, Saharunpore, . .. .. .. .. 1858
Brown, Forbes Scott, Esq., Merchant, Penang, .. .. 1840
Brown, Brigr. W. G., (H. M. 24th Regt.) Comdg. at Delhi, 1852
Brown, Capt. D., 1st Madras Fusiliers, Assist.-Commissioner, Bassein, Burmah, . .. .. .. .. 1856
Brown, George, Esq., Merchant, Calcutta, .. .. .. 1856
Brown, John, Esq., Merchant, Calcutta, .. .. .. 1858
Bruckner, A. Esq., Merchant, Calcutta, .. .. .. 1860
Buckle, W. B. Civil service, Chittagong, .. .. .. 1860
Bullen, John, N. Esq., Merchant, Calcutta, .. .. 1859
Buller,*† Frederick Pole, Esq., Civil service, .. .. 1837
Burbank,† Capt. Charles, Comg. H. C. Steamer "Fire Queen", .. .. .. .. .. .. .. 1857
Burn, G. A., Dr. 4th Cavalry Hydrabad Contingent, Aurungabad, Deccan, . . .. .. .. .. 1860
Burnett, Lieut.-Col. F. C., Bengal Artillery,) Jullundur, .. 1839
Burrows, Henry, Esq., Railway Contractor, Shahabad, .. 1860
Burton, John St. Edmund., Esq., Calcutta, .. .. 1850
Buzlall, Rhoman, Moonshee, Zemindar, Sealdah, .. .. 1857

Cadogan, T. C., Esq., Merchant, Calcutta, .. .. 1858
Cameron, J. T. D., Esq., Head-Master, La Martiniere, Cal., 1853
Campbell. W. F., Esq., Tipperah, .. .. .. .. 1838
Campbell,* Archibald, Esq., M. D., Medical Service, Superintendent of Darjeeling, .. .. .. .. .. 1838
Campbell, T. A., Esq., Palamow. .. .. .. .. 1851
Campbell,† Capt., A. M., (16th M. N. I.) .. .. .. 1855
Campbell, Capt. Ivie, Enam Commr., Ellichpore, .. .. 1854
Campbell, Capt. A. H., Comg. 8th Irr: Cavalry, Seetapore, Oude, .. .. .. .. .. .. 1859
Campbell,† Lieut. Henri, (63rd Regt. N. I.) .. .. 1856
Campbell,† George, Esq., Civil service, .. .. .. 1858
Canning, The Right Hon'ble, Charles John, Earl, .. .. 1856

Admitted.

Cantor, C. A., Esq., Merchant, Calcutta, *(Vice President,)* 1851
Carbery, R. J., Esq., Calcutta, .. .. .. .. 1853
Carew, R. R., Esq., Shajehanpore, .. .. .. .. 1846
Carnegy, P., Esq., Assist-Commissioner, Lucknow, .. 1857
Carter, T. E., Esq., Merchant, Calcutta, .. .. .. 1852
Cave, Charles, A. Esq., Indigo-planter, Konah factory, Purnea, .. .. .. .. .. .. .. 1857
Cave, H. S., Esq., Indigo-planter, Purneah, .. .. 1852
Cavenagh, Lieut.-Colonel O., (32nd N. I.) Governor of the Straits Settlements, .. .. .. .. 1848
Chamberlain, Capt. Chas., Oude Police, .. .. .. 1859
Chamberlain, Capt. T. H., (3rd European Regiment,) Asst. Supt. of Thuggee, Lucknow, .. .. .. .. 1860
Chamier, Capt. E., Deputy Commissioner, Nawabgunge, Oude, .. .. .. .. .. .. 1860
Champneys,† Lieut.-Col., E. G., (33rd N. I.,) .. .. 1848
Chandler, E. J , Esq., Sub. Collector, Cawnpore, .. .. 1860
Chapman, C. E., Esq., Civil service, Lahore, .. .. 1857
Chardon, E., Esq., Indigo-planter, .. .. .. .. 1858
Cheek, Alfred H., Esq., Civil Surgeon, Benares, .. .. 1855
Cheek, J. M. G., Esq., Bancoorah, .. .. .. .. 1860
Church, James, Esq., Merchant, Calcutta, .. .. .. 1850
Church,† James, Esq., Junior, Merchant, .. .. .. 1851
Clark, A. N., Esq., Allahabad, .. .. .. .. 1856
Clark, Dr. Stewart, Inspector Genl. of Prisons, N. W. P., .. 1855
Clarke, H. R., Esq., Civil service, Bareilly, . .. .. 1856
Clarke,† John, Esq., .. .. .. .. .. 1855
Clarke, G. R., Esq., Indigo-planter, Roodeipoor *viâ* Bongong, 1855
Clarke, Longueville, Esq., F. R. S., Barrister, Supreme Court, Calcutta, .. .. .. .. .. .. 1839
Cleghorn,† Dr. H., .. .. .. .. .. .. 1858
Clemen, Edward, Esq., .. .. .. .. .. 1855
Clerk, Dr., D. G., Dentist, Calcutta, .. .. .. 1856
Clerk, Lieut. Malcolm G., (D. P. W.) Lucknow, .. .. 1858
Cleve, T. A., Esq., Tea-planter, Hopetown, Darjeeling, .. 1860
Cockburn,† G. F., Esq., Civil service, .. .. .. 1856
Cockburn, Wm., Esq., Raneegunge, .. .. .. 1846
Cockerell, Capt. J , Comg. Divisional Battn. of Police, Benares, .. .. .. .. .. .. 1860
Collins, Dr., J. C., Civil Surgeon, Darjeeling, .. .. 1856
Collis, S. E., Esq., Solicitor, Calcutta, .. .. .. 1859
Colvile,*† Sir J. W., .. .. .. .. .. .. 1849
Commanding, Officer, 2nd Regt. Bombay Light Cavalry, Neemuch, .. .. .. .. .. .. 1860
Congreve, Lieut-Col. G., C. B., H. M. 29th Regt. Quarter-Master-General Queen's Troops, Simlah, .. .. .. 1848
Cooke, H. W., Esq., Sub-Depy. Opium Agent, Bhaugulpore, 1857

| | *Admitted.* |
|---|---|
| Cooke, C. N., Esq., Depy-Secretary, Bank of Bengal, .. | 1849 |
| Cope, Henry, Esq., Merchant, Umritsur, .. .. .. | 1847 |
| Cosserat, P., Esq., Ghazeepore, .. .. .. .. | 1857 |
| Cosserat Lewis, Esq., Indigo-planter, Lall Seraiah, Chumparun, .. .. .. .. .. .. | 1859 |
| Cossinauth, Chowdry, Baboo, Cossipore, .. .. .. | 1849 |
| Court,† M. H., Esq., Civil service, .. .. .. .. | 1852 |
| Cowell, James, Esq., Merchant, Calcutta, .. .. .. | 1838 |
| Cowie,* Henry, Esq., Merchant, Calcutta, .. .. .. | 1837 |
| Cox,† Major-General H C. M., 58th Regt. N. I., . .. | 1838 |
| Cox,† J. H. W., Esq., Indigo-planter, .. . .. | 1845 |
| Craster,† E. C., Esq., Civil service,.. .. . .. | 1858 |
| Craster, Lieut. G. A., Engineers, Noorpore, Punjab, .. | 1855 |
| Crawford,† J. A., Esq., Civil service, . .. .. | 1857 |
| Creswell, C. E., Esq., Merchant Calcutta, .. .. .. | 1855 |
| Crommelin, C. R., Esq. Deputy Commissioner, Roy, Bareilly, .. .. .. .. . . .. | 1860 |
| Crommellin, Lieut- Col., L. A., Darjeeling,.. .. . | 1857 |
| Crooke, Henry, Esq., Merchant, Calcutta, .. .. | 1858 |
| Crump, R. W., Esq., Monjoul Factory, Monghyr,. .. | 1859 |
| Cumming, William, Esq., Indigo-planter. Malda. .. | 1851 |
| Cunliffe,† R. E., Esq., Civil service, . .. .. | 1851 |
| Currie, Charles, Esq., Civil service, Lucknow, .. .. | 1855 |
| Curtis, J. F , Esq., Indigo-planter, Tirhoot. .. .. | 1860 |
| | |
| DALTON, Major E. T., Commissioner of Chota Nagpore, .. .. .. .. .. .. .. | 1848 |
| Dampier, H. L., Esq., Civil service, Calcutta, .. .. | 1857 |
| Dampier,† William, Esq., Civil service, .. .. .. | 1844 |
| Dashwood, H. W. Esq., Civil service, Banda, .. .. | 1860 |
| Daunt, W., Esq., Indigo-planter, Peepra, Champarun, .. | 1857 |
| Davies, Capt. T., Commt. Behar Police, Booldanah, .. | 1855 |
| Davies, J. S., Esq., District Supdt. of Roads, Bograh, .. | 1859 |
| Davis, Capt. J. S., Senior Assist.-Commissioner, Chota Nagpore, .. .. .. . .. .. .. | 1857 |
| Davis, H. M., Esq., Civil Surgeon, Noacolly, .. .. | 1856 |
| Davis, Dr. J. Civil Surgeon, Bassein, .. .. .. | 1860 |
| D'Cruz, A., Esq., Junior, Secretariat Govt. of India, .. | 1852 |
| Dear, Herschel., Esq., Monghyr, .. .. .. .. | 1860 |
| Dearman,† George, Esq., Merchant, .. .. .. | 1845 |
| Degumber, Mitter, Baboo, Merchant, Calcutta, .. .. | 1858 |
| DeMornay,† H., Esq., Managing Director, Assam Company, | 1843 |
| Dennehy, Capt. T. Commanding Allahabad Divisional Military Police Battn... .. .. .. .. .. | 1860 |
| DePenning, George, Esq., Calcutta,.. .. .. .. | 1856 |
| DeSaran, Eugene Dubois, Esq., Cootooreah factory, Kishnaghur, .. .. .. .. .. .. .. | 1858 |

*Admitted.*

Deverell, H., Esq., Indigo-planter, Ackergunge factory, Berhampore, .. .. .. .. .. .. 1854
Dicey,† Capt. Wm., .. .. .. .. .. .. 1858
Dickens, Capt. C. H., Artillery, Calcutta, .. .. .. 1856
Dickey, Col. E. J., Supt., of Studs, Meerut, .. .. 1851
Dickson, T., Esq., Calcutta, .. .. . .. .. 1859
Dixon, Lieut. Alfred, Bengal Horse Artillery, Benares, .. 1860
Dombal, M. E. Durup de, Esq , Monghyr, .. . 1860
Dorin,† Joseph Alexander, Esq., .. .. . .. 1837
Douglas, Francis, Esq., M. D., Civil Surgeon, Lucknow, .. 1859
Douglas, Stewart, Esq , Merchant, Calcutta, .. .. 1851
Doveton, H., Esq , Deputy-Magistrate, Buheera, Tirhoot, 1855
Doyne, Richard, Esq., Barrister-at- law, Calcutta, . .. 1855
Drabble,† R. R., Esq , Merchant, .. .. .. 1850
Drew, Capt H. R. Commandant Kamroop Regiment, Furreedpore, .. .. .. .. .. .. 1860
Drummond,† The Hon'ble R , Civil service, .. .. 1852
Drury, Capt C. C 31 N. I Cawnpore, .. .. .. 1860
Dwarkanath Mullick, Baboo, Calcutta, .. .. .. 1859
Dumergue, J. S., Esq. Civil service, Allyghur, . . 1847
Du[illegible]o, R. Esq., Howrah, .. . .. .. .. 1859
Dunford, Hamilton E. A., Esq., Bengal Yeomanry Cavalry, Hoshingabad, . .. .. .. .. .. 1856
Durand, P., Esq., Indigo-planter. Jessore, . . .. 1852
Duerschmidt, Chas., Esq., Merchant, Calcutta, .. . 1847
Dyer, A. K. Esq., (Mercantile Bank) Ceylon, .. .. 1860

Eames, R Esq., Merchant, Calcutta, .. .. . 1855
Earle, Dr., F. J., Civil Surgeon, Purneah, .. .. . 1859
Eddis, W. U., Esq., Hizlabut factory, Pubna, .. .. 1858
Edgeworth,† Michael Pakenham, Esq., Civil service, .. 1836
Edwards, The Honble. G W Governor of Labuan, .. 1860
Egerton., James, Esq., Cajah factory. Purneah, . .. 1856
Eliot, Capt. John, Artillery, Dugshai .. .. .. 1839
Elliot, J. B., Esq., Patna, .. . .. .. .. 1851
Elliot,† J. Scott. Esq , Merchant, . .. .. .. 1851
Elliott,† W Henry, Esq., .. . . .. .. 1839
Erskine, H. C., Esq., Indigo-planter, Elambazar, Paneeghur, 1855
Eshanchunder Bose, Baboo, Merchant, Calcutta, .. .. 1848
Evans, George E., Esq., Curator Geological Museum, Calcutta, .. .. .. .. .. ... 1859
Eyre, Col. Vincent, C. B., Bengal Artillery, Ishapore, .. 1859

Faddy, Major S. B , 36th N. I., .. .. . .. 1851
Fagan, G. S., Esq., Barrister Supreme Court, Calcutta, .. 1855
Fagan, Capt. W. F., Commt. 7th Police Bn. Dacca, .. 1859
Falcon, A. B., Esq , Civil service, Noacolly, .. .. 1858
Falconer,† H., Esq., M. D., . .. .. .. .. 1839

| | Admitted. |
|---|---|
| Fane, Edward Esq , Madras Civil service, Vizagapatam, .. | 1860 |
| Fell, H. H , Esq., Zemaneah factory, Ghazeepore, .. .. | 1850 |
| Fergusson, William Fairlie, Esq., Merchant, Calcutta, .. | 1837 |
| Field, George, Esq., Sub-Deputy Opium Agent, Arrah, .. | 1857 |
| Finch, Justin, Esq., Indigo-planter, Shahpore Oondee, Tirhoot, .. .. .. .. .. .. | 1852 |
| Firminger, Rev. T. A. C., Chinsurah, .. .. .. | 1851 |
| Fitzpatrick, W. Esq , Sultungunge, Bhaugulpore, .. .. | 1860 |
| Fitzgerald, Capt. C. M. Dy. Commissary General, .. .. | 1860 |
| Fitzwilliam, Wm. Shelford, Esq., Agent Mercantile Bank Calcutta, .. .. .. .. .. .. .. | 1856 |
| Foord,† E. B., Esq., Madras Civil service. .. .. .. | 1853 |
| Forbes, Alexander, Esq., Calcutta, . .. . | 1855 |
| Forbes, Lieut. H. T , Supt. Nuddea Rivers, Berhampore, | 1856 |
| Forlong, James, Esq., Durbunga, .. .. .. | 1850 |
| Forsyth, Capt. A. G., Second in Command First Regiment Assam Light Infy., Debrooghur, .. .. .. .. | 1860 |
| Fraser,† Thomas, Esq., Indigo-planter, . .. .. | 1856 |
| French, Gilson R. Esq., Indigo-planter, .. .. .. | 1841 |
| French, Henry G., Esq., Indigo planter, Jessore, . .. | 1839 |
| Frere, Honble Sir Bartle, K. C. B Calcutta, . .. | 1860 |
| Fressanges, J. S. Esq., Merchant, Akyab, .. . | 1860 |
| Fytche, Major A., (70th Regt. N. I.,) Dpy. Comr. Bassein, | 1849 |
| | |
| Gale, C. W., Esq., Doora factory, Tirhoot, .. .. | 1856 |
| Gale, John, Esq., Pundul factory, Tirhoot, .. .. .. | 1859 |
| Galiffe, J F., Esq., Collector of Canal Tolls, Calcutta .. | 1856 |
| Garden, Dr. Alexander, Civil Assistant Surgeon, Ghazeepore, | 1860 |
| Garnault, Lt. H. W., Executive Engineer, Midnapore, .. | 1859 |
| Garrett, C B. Esq., Civil service, Midnapore, .. .. | 1860 |
| Garstin, Major H. M., (36th Regt. N. I.) Comdt. Arracan Battalion, Akyab, .. . .. . .. | 1855 |
| Garstin, Genl. Edward, (Engineers,) Darjeeling, .. . | 1834 |
| Garstin, J. W. Esq., Deputy Magistrate, Buxar, .. .. | 1860 |
| Gasper, G. M., Esq , Merchant, Calcutta, .. .. .. | 1846 |
| Gennoe, T. A. M., Esq., Supt. Benares Opium factory, Ghazeepore, .. .. .. .. .. .. | 1859 |
| George, Adam, Esq., Calcutta, .. .. .. .. | 1853 |
| Gibbon, T. M. Esq., Indigo-planter, Turcooleah factory, Tirhoot, .. .. .. .. .. .. .. | 1860 |
| Glinn, G. J. H., Esq., Engineer, E. I. Railway, Colgong, .. | 1858 |
| Glover, F. A., Esq., Civil service, Mymensing, .. .. | 1859 |
| Gobind Chunder Dutt, Baboo, Merchant, Calcutta, .. | 1857 |
| Gobind Chunder Sen, Baboo, Merchant, Calcutta, .. | 1850 |
| Gopaul Laul Tagore, Baboo, Merchant, Calcutta, . .. | 1850 |
| Gordon, D. T., Esq., Manager Silk Filatures, Surdah, .. | 1859 |
| Gordon, Thomas, Esq., Merchant, Mirzapore, .. .. | 1846 |
| Gouldhawke, J , Esq., Indigo-planter, Jessore, .. .. | 1851 |

Graham, H., Esq., Superintending-Surgeon, Pegu, .. .. 1855
Graham, Joseph, Esq., Barrister-at-law, Calcutta, .. .. 1858
Grant, Hon'ble John Peter, Civil service, Calcutta, .. 1836
Grant, James, Esq., Civil service, Dinagepore, .. . 1837
Grant, Thomas, Esq., Indigo-planter, Bhaugulpore, .. 1848
Grant, G. H.. Esq., Indigo-planter, Bhaugulpore, .. .. 1859
Grant, John Peter Esq., Junr. Civil service, . .. 1860
Gray, J. J., Esq , Indigo-planter, Malda, .. .. .. 1846
Gray, Capt. W. G. Bengal Artillery, Almorah, .. .. 1860
Grey, Edward, Esq., Civil service, Gyah, .. .. .. 1859
Griffiths, S. P., Esq., Merchant, Calcutta, .. .. 1844
Grote * Arthur, Esq., Civil service, Calcutta, *(Vice President,)* 1837
Gubbins, M. R., Esq . Civil service, Agra, .. .. 1842
Guise, Dr. J. A., Civil Surgeon, Moorshedabad, . .. 1859
Guise,† Lieut.-Col. John C. 90th Lt. Infy., .. .. 1859

Hall, Major G. M., (Commd. 4th Regt, Irr. Cavalry,) Nowgong, . .. . .. .. .. 1854
Hall, James M., Esq., Merchant, Calcutta, .. .. 1851
Halleur, Dr. H. Professor Natural History, Presidency College, Calcutta, . .. .. .. . .. 1860
Halliday,† F. M., Esq., C. S. .. .. .. .. 1859
Halsey, W. Esq., Civil service, Mirzapore, .. .. .. 1860
Hamilton, H. C. Esq., Civil service, Benares, .. .. 1851
Hampton, J. P., Esq., Indigo-planter, Commercolly, .. 1856
Hannyngton, Lt.-Col. John C., Military Aud. General, Calcutta, .. . . .. .. . . 1837
Hannay, Lt.-Col. Simon Fraser, (43rd Regiment N. I.,) Commanding Assam Light Infantry, Debrooghur, .. 1837
Harvey, William, Esq , Civil Engineer, Indore, .. .. 1859
Harvey, C. F. Esq., Bengal Civil service, Backergunge, .. 1859
Haughton, Capt. J. C. Supt., Port Blair, Andamans, .. 1859
Hawkins,*† John Abraham Francis, Esq., .. .. .. 1837
Haworth, William, Esq., Merchant, Calcutta, .. .. 1851
Hay,‡ John Ogilvie, Esq., Merchant, .. .. .. 1858
Healy, B. Esq., Merchant, Bimlipatam, . .. 1859
Hearsey, Major-General Sir J. B., K. C. B., Comg. Presy. Divn. Barrackpore, .. - .. .. .. .. 1856
Hedger, J. F., Esq., Radakissenpore, *viâ* Kamra, .. 1853
Helbert,† Lt. F. J. H., (5th Madras Cavalry,) .. .. 1855
Heralall Seal,* Baboo, Calcutta, .. .. .. .. 1858
Herklots, J. G. C. Esq., Silk Manufacturer, Berhampore,.. 1860
Hewitt, J. F. K. Esq., Civil service, Bancoorah, .. .. 1860
Hickey, W. R. Gilbert, Esq., Civil Engineer, .. .. 1856
Higgs, Rev. E., Debrooghur, Upper Assam, .. .. 1853
Hill, James, Esq., Allahabad, .. .. .. .. 1858
Hill,*† James, Esq., Senior, Indigo-planter, .. .. 1837
Hilson, A. H. Esq., Medical service, Gonda, Oude, . 1860

*Admitted*

Hitchens,† Lt., C. J., (late 5th N. I.,) .. .. .. 1857
Hollings, Charles, Esq., Gyah, .. .. .. .. 1841
Holroyd, Capt Chas,, Assist.-Commr. Sibsagur, Assam, .. 1849
Hooke, B. Esq., Civil Surgeon, Tavoy, .. .. .. 1860
Hope, Alexander, Esq., Civil service, Beerbhoom,.. .. 1859
Hopkinson, Capt. H. Commissioner of Assam, .. .. 1856
Horee Mohun Sen, Baboo, Calcutta, .. .. .. 1837
Horne,† C., Esq., Civil service, .. .. .. .. 1854
Houghton, Lt. Col. R. (16th Regt. N. I.,) Mussoree, .. 1847
Hudson, C. K., Esq., Cherra, . .. .. .. 1855
Hudson,† W. S., Esq., Jun.-Assist. to Commissioner of Assam, . .. .. .. .. .. .. 1854
Hudson, E., Esq., E. I. Railway, Calcutta,.. .. .. 1859
Hurst, H. A. Esq., Merchant, Calcutta, .. .. 1860
Hutchinson, Capt. W. G. (28th M. N. I.) A. C. G. Moulmein, . . . . .. 1860
Hutchinson, Dr. R. F. Civil Surgeon, Arrah, .. .. 1860
Huthwaite, Col. Edward, C. B., (Horse Arty.,) Nainee Tal, 1841
Hutton, Capt. Thos., Mussooree, .. .. . .. 1855

Ilbery,† J. W. H., Esq., Merchant, .. . .. 1858
Impey, Major. Archibald, Bengal Engineers, Darjeeling, . 1856
Inglis,† Henry, Esq., . .. .. .. .. 1835
Inglis,† J., Esq., Civil service, .. .. .. 1851
Ingram, Lieut. J. S., (1st European Bengal Fusiliers,) Assist.-Supt. Pegu and Arracan Mountain Road, .. 1855
Irby,† Capt. L. H., H. M. 90th Regt., .. .. . 1859
Ishore Persaud Narain Sing, Bahadoor, Raja of Benares, .. 1854
Issur Chunder Sing, Rajah, Zemindar, Calcutta, .. .. 1857

Jackson, A. J., Esq., Civil service, Hoogly, .. .. 1853
Jackson, L. S., Esq., Civil service, Bauleah, .. . 1852
Jackson, Dr. Neville, Civil Medcal Officer, and Sub-Assist. Commissioner, Sumbulpore, .. .. .. .. 1859
Jackson, Elphinstone, Esq , Civil service, Midnapore, .. 1860
Jalaloodeen, Prince Mahomed, Russapugla, .. .. 1860
Jameson, W., Esq., M. D., Supt. H. C. Bot. Garden, Saharunpore, .. . .. . .. 1852
Jenkins,† Lieut. H. G., (4th Light Cavalry,) Benares, .. 1852
Jenkinson, Joshua, Esq., Calcutta, .. .. . 1855
Jennings, C. R., Esq., Silk Manufacturer, Rampore Bauleah, 1848
Jennings,† Frederick, Esq., .. .. .. .. 1856
Johnson, John, Esq., Merchant, Calcutta, .. . .. 1856
Johnson, P., Esq., Merchant, Calcutta, .. .. .. 1846
Johnson, J. C. Esq., Indigo-planter, Purneah, .. .. 1860
Johnstone, Capt. H. C., Revenue Survey, Punjab, . .. 1852
Jotendromohun Tagore, Baboo, Calcutta, .. .. .. 1858
Joygopal Bysack, Baboo, Calcutta, .. .. .. .. 1858

*Admitted.*

Joykissen, Mookerjee, Baboo, Zemindar, Ooterparah, .. 1852
Judge, W. J. Esq., Solicitor, Calcutta, .. .. .. 1858
Judge,† Spencer, Esq., Solicitor, .. .. .. .. 1843
Judge, Lt. C. N., Bengal Engineers, Dehree Ghat, on the Soane, Grand Trunk Road, . . .. .. 1859
Jung Bahadoor, Moharajah, G. C. B. Nepal, .. .. 1860

Kalee Prosono Sing, Baboo, Calcutta, .. .. .. 1857
Kalee Coomar Dey, Baboo, Merchant, Calcutta, .. .. 1858
Kelner, G. F. Esq., Burdwan, .. .. .. .. 1858
Kemp, F. B., Esq., Civil service, Backergunge, .. .. 1856
Kemp, G T B. Esq. Deputy-Magistrate, Chittagong, .. 1859
Kendal, B. Esq., Civil Surgeon, Midnapore, .. .. 1858
Kenny, T., Esq., Indigo-planter, Salgamudea, Commercolly, 1852
Khaluch Chunder Ghose, Baboo, Calcutta, .. .. 1857
Kilburn, E. D. Esq., Merchant, Calcutta, .. .. 1860
Kilby, Thos. F., Esq., Merchant, Calcutta, .. .. 1859
King, Arthur Kaye, Esq., Merchant, Calcutta, .. .. 1858
King, Robert, Esq., Sub-Deputy Opium Agent, Patna, .. 1850
Kinleside,† Lt.-Col. R. R., (Artillery,) .. .. .. 1847
Kissenkishore Ghose, Baboo, Pleader Sudder Court, Calcutta, 1853
Kistogopal Ghose, Zemindar, Calcutta, .. .. .. 1853
Knowles H., Esq., Merchant, Calcutta, .. .. .. 1852
Knox, T. J., Esq., Madras Civil service, Vizagapatam, .. 1858
Knyvett, Lt.-Col. W. J. B (38th Lt. Infy.,) Mussooree, .. 1851

Laing, Rev Malcolm, S. Chaplain of Futtyghur, .. 1860
Lamb, Major Wm., (51st Regt. N. I.,) Assist-Adjt.-Genl., Lahore Division, .. . .. .. .. .. 1847
Landale, R. B Esq., Indigo-planter. Dheeree *viâ* Shergotty 1853
Landale, Walter Esq., Indigo-planter, Lutteepore factory. Bhaugulpore, .. .. .. .. .. .. 1851
Lance, C. E. Esq , Civil service, Dacca, .. .. .. 1858
Lane, Major-Genl. J. T., C. B., .. .. .. .. 1851
Lane, T. B., Esq., Civil service, Tirhoot, .. .. . 1855
Larkins, T. P. Esq., Civil service, Bograh, .. 1853
Larmour, R. T., Esq., Indigo-planter, Mulnauth, *viâ* Bongong, .. .. .. .. . .. .. 1848
Lauder, Richard, Esq., Merchant, Calcutta, .. .. 1856
Lautour, E. F., Esq., Civil service, Patna, .. .. 1847
Lautour, Edward, Esq . Civil service, Calcutta, .. .. 1851
Lee,† H. J., Esq., .. . .. .. .. .. 1851
Lees, Capt. W. N., L L.. D, Calcutta, .. .. .. 1860
Leonard, H. Esq., Supt. of the Mutlah, .. . .. 1858
Levinge, H. C. Esq., E. I Railway Dept. Colgong, .. 1855
Lewis, W. T. Honble, Resident Councillor, Penang, .. 1840
Limond, R. S., Esq. Indigo-planter, Toolseah factory, Bhaugulgore, .. .. .. .. .. .. 1859

| | Admitted. |
|---|---|
| Lillie, J. E. S. Esq., Civil service, Hooghly, .. .. | 1860 |
| Lind,† F. M., Esq , Civil service, .. .. .. .. | 1851 |
| Lindsay,† D. B., Esq., Merchant, .. .. .. .. | 1855 |
| Lindsay,† Edward, James, Esq., Merchant, .. .. | 1860 |
| Little,† Lt.-Col. Archibald (H. M. 9th Lancers,) .. .. | 1853 |
| Lloyd, Major-Genl G. W. A., C. B., Darjeeling, .. .. | 1838 |
| * Loch, George, Esq., Civil service, Calcutta, .. .. .. | 1852* |
| Loch, J. A., Esq., M. D. Civil Surgeon, Mirzapoor, .. | 1859 |
| Login,*† Sir J. S., Medical service, .. .. .. | 1843 |
| Long, The Rev. James, Church Missionary Society, Calcutta, | 1855 |
| Lord, G. F., Esq., Manager Bengal Coal Company, Raneegunge, .. .. .. .. .. .. | 1858 |
| Low,† The Hon'ble Major-General, J , C. B., .. .. | 1854 |
| Lowther,† Capt. W. H., .. .. .. .. .. | 1856 |
| Lowther, *† Robert, Esq., Civil service, .. .. .. | 1836 |
| Luckin, Capt. F. Pay-master, 2nd Dragoon Guards, Deyra-Dhoon, .. .. .. | 1860 |
| Lumsden,† Capt. P. S., Dy. Asst. Qr. Mr. Genl. .. .. | 1851 |
| Lushington, Edward, Esq., Civil service, Calcutta, . .. | 1848 |
| Lyall,† John, Esq., Merchant, .. .. .. .. | 1849 |
| Maccrea, R., Esq., Commissariat Dept., Lucknow, .. | 1856 |
| Macdonald, A. G., Esq., Civil service, Rungpore, .. | 1852 |
| Macdonell, Capt. A. A., (40th N. I.,) Poosa, Tirhoot, .. | 1855 |
| Mackay,† R. B., Esq. Merchant, .. .. .. .. | 1858 |
| Mackenzie, H. Esq., Indigo-planter, Jingergatchie, Jessore, | 1850 |
| Mackenzie, W. L., Esq, Deputy-Magistrate, Serajgunge, . | 1858 |
| Mackeson, Capt. F. L. 2nd in Command Meywar Bheel Corps, Kherwarra, *viâ* Neemuch, .. .. ... | 1860 |
| Mackey, D. C., Esq., Merchant, Calcutta, .. .. .. | 1854 |
| Mackinnon, Lieut. W. C., H. M. 87th Fusiliers, .. .. | 1858 |
| Mackinnon, Peter, Esq., Merchant, Calcutta, .. .. | 1860 |
| Mackintosh,† George, G., Esq., Civil service, .. .. | 1838 |
| Mackintosh,† Æneas, Esq., Indigo-planter, .. .. | 1849 |
| Mackintosh, Edwin, Esq., Cawnpore, .. .. .. | 1860 |
| Maclean, A. Esq., Civil service, Kishnaghur, .. .. | 1858 |
| Macleod, George, Esq., Rajapore Factory, Rajshahye, .. | 1858 |
| Macnair,† George, Esq., Indigo-planter, .. .. .. | 1851 |
| Macnamara, N. C., Esq., Civil Surgeon, Tirhoot, .. .. | 1859 |
| Macpherson,*† George G., Esq. .. .. . | 1836 |
| Macpherson, Major, H. T (82 Foot,) Comg. Sirmoor Rifles, Deyrah Dhoon, .. .. .. | 1860 |
| Maharaj* Dheraj Matabchunder Bahadoor, Rajah of Burdwan, .. .. .. .. .. .. | 1836 |
| Maharajah of Cooch Behar, .. .. .. .. | 1856 |
| Malchus, G., Esq., Merchant, Calcutta, .. .. .. | 1852 |
| Malet, O. W., Civil service, Beerbhoom, .. .. .. | 1857 |
| Mangles,† J. H., Esq. Civil service, .. .. .. | 1853 |

Admitted.

Manickjee,* Rustomjee, Esq., Merchant, Calcutta, .. 1837
Mantell, Dr. A. A., Civil Surgeon, Balasore, .. .. 1859
Menzies, T., Esq., Merchant, Mirzapore, . .. .. 1858
Marriott,† Major E., (57th N. I.,) .. .. .. .. 1852
Marriott, Hunt, Esq., Emigration Agent, Calcutta,.. .. 1859
Martin,† Lieut. Col. T., .. .. .. .. .. 1852
•Martin,† Simon N., Esq., Civil service, . .. .. 1855
Maseyk, Henry, Esq., Neemtolla, Moorshedabad, .. .. 1858
Maseyk, J. W., Esq., Indigo-planter, Jungypore, .. .. 1858
Mason,† Lt. C., Crauford, (48th M. N. I. . .. .. 1853
Mason, Capt. James, Darjeeling, .. .. . . 1858
Masters,* J. W., Esq., Assist.-Commissioner of Assam, Golah Ghat., . .. .. .. .. .. 1835
Mathie,* Lt.-Col. James, .. .. .. .. .. 1836
Maunsell, Lt. F. R., Engineers, Roorkee, .. . .. 1855
Maxwell, David, Esq., Indigo-planter, Cawnpore, .. .. 1852
May,† George, Esq., Merchant, .. .. .. .. 1857
McCullum,† D., Esq , Merchant, .. . .. .. 1836
McDonel,† E., Esq., Sub-Deputy Opium Agent, .. . 1842
McLeod,† Donald Frield, Esq., Civil service, .. . 1836
McMullin, Major, J. R. Comg. Military Police, Gorruckpore, 1860
Meares, Geo. Esq., Indigo-planter, Sindooree, Jessore, .. 1855
Meik, J. P. Esq., Railway Contractor, Kissengung, Nuddea, 1860
Mercer,* G. G., Esq., Indigo-Planter, Futtyghur, . .. 1846
Miles, Capt. C. W. (Com. 3rd Regt. Oude Irregular Infy.,) Azimghur, .. .. .. . . .. 1857
Miller, Edward, Esq. Merchant, Calcutta, .. .. .. 1856
Mills,*† Andrew John Moffat, Esq., .. .. .. .. 1836
Mills, R. Esq., E. I. Railway, Howrah, .. . .. 1858
Mohr, Edward, Esq., Merchant, Arracan, .. .. .. 1857
Monckton,† H., Esq., Civil service, .. .. .. 1847
Moncrieff, R. S., Esq , Merchant, Calcutta,.. .. .. 1858
Money,*† William James Henry, Esq., Civil service, .. 1836
Money, W. Esq., Barister-at-Law, Calcutta, .. .. 1860
Montgomery, The Hon'ble Sir R., C. S., Lahore, .. .. 1853
Morgan, R. B., Esq., Civil service, Agra, .. .. .. 1852
Morrell, R., Esq., Zemindar, Backergunge, . .. .. 1853
Morris, Dr. Thomas John, Akyab, .. .. .. .. 1859
Morris, Frederick W. Esq., Madras Civil service, Chitterpore, Gangam, .. .. .. .. .. .. .. 1859
Morris,† James, Esq. Merchant, . .. .. .. 1855
Morton, Capt. William Elliot, (Bengal Engineers,) Roorkee, 1851
Mountjoy, Dr. W. J., Sylhet, .. .. .. .. 1852
Mouat, Dr. F. J., Inspector of Jails, L. P ,.. .. .. 1856
Moyne, C. Esq. Silk Filatures, Jungypore,.. . . 1860
Murdoch, H. H. Esq., Merchant, Calcutta,.. .. .. 1858
Murray, J. C., Esq., Merchant, Calcutta, .. .. .. 1856
Murray, Lt. C., Commg. Sebundy Sappers, Darjeeling, .. 1855

*Admitted.*

Muspratt, J. R., Esq., Civil service, Bhaugulpore, .. 1847

NAESMYTH, J. Esq., Civil service, Hissar, .. .. .. 1852
Nation, Capt. J. L. Comg. 9th Police Batt. Chota Nagpore, 1860
Newcomen, Robert, Esq., Indigo-planter, Connanuggur Facty., Kishnaghur, .. .. .. .. .. 1859
Nicol,† F. A. M., Esq., .. .. .. .. .. 1851
Nilmoney Muttyloll, Baboo, Calcutta, .. .. .. 1858
Nuthall, R. D, Esq., Assist. Supt. Kheddahs, Deebroghur 1858
Nuthall, Major, W. F. Comg. Pegu-Levy, Rangoon, .. 1860

OAKES, Capt. W. H., Deputy-Commissioner, Chota Nagpore, 1857
Oboychurn Goho, Baboo, Merchant, Calcutta, .. . 1856
Ockleton, T. P., Esq., Calcutta, .. .. .. .. 1856
Oliva, L. B., Esq., Merchant, Calcutta, .. .. .. 1857
Omachurn Mittra, Baboo, Merchant, Calcutta, .. .. 1857
Oman. C. P. A., Esq., Indigo-planter, Hatowree Factory, Tirhoot, .. .. .. .. .. .. .. 1859
Onraet,† P. T., Esq., . .. .. .. .. .. 1857
Onslow, H. P, Esq., Collector of Bassein, .. .. .. 1859
Orr, Major. A. P. Roy Bareilly, Oude, . .. .. 1859
Orr, Capt. A. P. W., Mussooree, .. .. .. .. 1860
Owen, Capt. W. G., (11th Madras N. I.,) Nursapatam, near Payakerowpett, . .. .. .. .. 1846

PALLISER, Capt. C. H., 2nd Regiment Hudson's Horse, Gonda, Oude,.. . .. .. . .. 1860
Palmer, R. S., Esq., Merchant, Calcutta,.. .. .. 1844
Palmer, Charles, Esq., Medical service, Calcutta, .. .. 1848
Palmer, Dr. W. J., Civil Surgeon, Ghazeepore, .. .. 1856
Palmer, A. V., Esq., Civil service, Patna, .. .. .. 1858
Palmer, George, Esq., Civil service, Bijnour, .. .. 1859
Pamberton, Lieut. R. Boileau, (Bengal Engineers) Seetapore, Oude, .. . . .. .. 1859
Parish, Rev. Charles, Chaplain of Moulmein, .. .. 1856
Parker, John. Esq., Architect, Burdwan, .. .. .. 1860
Parry, John, Esq., Merchant, Calcutta, .. .. .. 1856
Parsons, Major-Genl. James, C. B., Almorah, .. .. 1838
Paterson, C. Esq., Indigo-planter, Colgong, . .. .. 1858
Paul. G. C, Esq, Barristr-at-law, Calcutta,.. .. .. 1856
Payne, Dr. A J., Medical service, Calcutta, .. .. 1860
Peacock, the Honorable Sir Barnes, Chief Justice, Supreme Court, Calcutta, .. .. .. .. .. .. 1852
Peary Chand Mittra, Baboo, Secretary Public Library, Calcutta, (*Vice-President,*) .. .. . .. .. 1847
Peary Mohun Chowdry, Baboo, Zemindar, Calcutta, .. 1858
Peppe, T. F. Esq., Sub-Deputy Opium Agent, Betiah, .. 1860
Pepper, G. Esq, Civil service, Noacolly, .. .. .. 1860

| | Admitted. |
|---|---|
| Pereira, L. S. B, Esq., Asst.-Engineer, Southal Pergunnahs, Pukour, *viâ* Jungepore, .. .. .. .. .. | 1859 |
| Perkins Dr. R. H., Civil Surgeon and Asst. Salt Agent, Hidgelee, .. .. .. .. .. .. | 1859 |
| Perrin, Monsieur, J. Silk Filature, Berhampore, .. .. | 1859 |
| Pertap Chunder Sing,* Bahadoor, Rajah, Zemindar, Pakpara (*Vice-President,*) .. .. .. .. .. | 1847 |
| Peskett, William, Esq., M. D, Civil Surgeon, .. .. | 1856 |
| Peterson, A. T. T., Esq., Barrister, Supreme Court, Calcutta, | 1849 |
| Phayre, Col. A. P., Commissioner of Pegu, .. .. | 1841 |
| Phillippe, Clement, Esq, Indigo-planter, Balacole, Pubna, | 1851 |
| Phillips, James, Esq., Indigo-planter, Dhoolerry Factory, Pubna, .. .. .. .. .. .. | 1858 |
| Pigou, Arthur, Esq., Civil service, Berhampore, .. .. | 1860 |
| Pinheiro, J. A, Esq, Thaneysur, .. .. .. .. | 1859 |
| Pittar, C. J. Esq, Calcutta, .. .. .. . | 1857 |
| Pogose, J. G. N., Esq., Zemindar, Dacca, .. .. .. | 1856 |
| Pollok, P. T., (Madras Army) Executive Engineer, Tonghoo, Burmah, .. .. .. .. .. .. .. | 1860 |
| Porteous, H. A., Esq., Agriculturist, Akyab, .. .. | 1859 |
| Pottit Pabun Sen, Baboo, Merchant, Calcutta .. .. | 1847 |
| Power, Capt. E. H., Dy-Judge-Advocate-Genl., Rangoon, .. | 1856 |
| Prankissen Mookerjee, Baboo, Merchant, Calcutta,.. .. | 1858 |
| Preonauth Sett, Baboo, Calcutta, . .. .. .. | 1852 |
| Prestwich, E., Esq., Merchant, Calcutta, . .. .. | 1858 |
| Pringle, Dr. R. Civil Surgeon, Cuttack, .. .. | 1859 |
| Pringle, W. H Esq., Supt. Coal. Depôt, Ompta *viâ* Moisraka, | 1860 |
| Prinsep, H. T., Esq., Civil service, Howrah, .. .. | 1858 |
| Prinsep, J. H, Esq, Civil service, Sealkote, .. | 1851 |
| Prosonnonarain Deb,* Bahadoor Roy, Dewan of His Highness the Nawab of Moorshedabad, .. .. .. | 1859 |
| Prosonnonath Roy, Rajah, Zemindar, Digaputi, Nattore. .. | 1851 |
| Prosono Coomar Tagore, Baboo, Calcutta .. .. . | 1833 |
| Puddumlochun Mundul, Baboo, Balasore, .. . | 1857 |
| Pughe, Capt. J., R. (47th N. I.) Commt. Police Corps, Sooree, .. .. .. .. . . .. | 1859 |
| Quinton, J. W., Esq, Civil service, Bulleah, Ghazeepore .. | 1860 |
| Raban, Capt. H. Comdt. 4th Bengal Police Battn, . | 1858 |
| Raikes, H. T, Esq., Civil service, Calcutta, .. .. | 1857 |
| Rainier, Col. D., H. M. 98th Foot, Peshawur, .. .. | 1860 |
| Rajendur Dutt, Baboo, Merchant, Calcutta, . . | 1848 |
| Rajkissen Mookerjea,* Baboo, Landholder, Ooterparah, .. | 1836 |
| Ramanauth Tagore, Baboo, Calcutta, .. .. .. | 1842 |
| Ramapersaud Roy, Baboo, Calcutta, .. .. .. | 1848 |
| Ramchund Sing, Rajah, Calcutta, .. .. . .. | 1843 |
| Ramgopal Ghose, Baboo, Calcutta, .. .. .. .. | 1840 |

| | Admitted. |
|---|---|
| Ramkissen Doss, Baboo, Calcutta, .. .. .. .. | 1858 |
| Ramnarain Mookerjea, Baboo, Zemindar, Jonaye, .. .. | 1858 |
| Ramsay, Major George, Resident at Nepal, .. .. | 1855 |
| Rao of Bedla, .. .. .. .. .. .. | 1859 |
| Read, Capt. H. E., (late 50th N. I.) Roorkee, .. .. | 1860 |
| Reade, C. W., Esq., Madras Civil service, .. .. .. | 1859 |
| Reid, H. M , Esq., Civil service, Rampore, Bauleah, .. | 185[illegible] |
| Reid, Lieut., Col., David, Artillery, .. .. .. | 1851 |
| Reid, F., Esq., Supt. of Irrigation, Rohilkund, .. .. | 1858 |
| Richard,*† J., Esq , Merchant, .. .. .. .. | 1834 |
| Richardson, R. J. Esq., Civil service, Arrah, .. .. | 1859 |
| Riddell, Col. C. J. B , C B., Royal Artillery, Benares, .. | 1858 |
| Riddell, H. B., Esq., Civil service, . .. .. .. | 1855 |
| Rigby, Lt.-Col. Henry, (Engineers,) Lahore, .. .. | 1852 |
| Ripley, Capt. F. W., (22nd Regt. N. I.,) Asst-Commissioner of Arracan, Kyouk Phyoo, Calcutta, .. .. | 1849 |
| Ritchie, W., Esq., Advocate-General, .. .. .. | 1851 |
| Roberts, J. B., Esq,, H. M. Coroner for Calcutta, .. .. | 1858 |
| Robinson, S. H., Esq., Merchant, Calcutta, .. .. | 1854 |
| Robinson, T. M., Esq , Merchant, Calcutta, .. .. | 1848 |
| Rogers,† Captain T. E., .. .. .. .. .. | 1843 |
| Rogers,† George Esq., Solicitor, .. .. .. .. | 1858 |
| Roghé, A. W., Esq., Merchant, Akyab, .. .. .. | 1859 |
| Rome, James, Esq , Merchant, Calcutta, .. .. .. | 1859 |
| Roquet, V. Esq , Indigo-planter, Moharajgunge Factory, Agimghur, .. . .. .. .. .. | 1860 |
| Rose, Henry, Esq., Civil service, Chaprah, .. .. .. | 1846 |
| Rose, W. Grant, Esq., Merchant, Calcutta, .. .. .. | 1837 |
| Rose, Richard, Esq., Commissariat Depot. Doomree, .. | 1860 |
| Ross, Alexander, Esq., Civil service, Agra, .. .. .. | 1858 |
| Ross,† J. G., Esq., .. .. .. .. .. .. | 1852 |
| Ross, R F., Esq., Merchant, Calcutta, .. .. .. | 1855 |
| Ross, Lieut. D. Adjt. 1st Assam Battalion, Debrooghur,. .. | 1858 |
| Ross, Andrew Esq., C. S. Azimghur, .. .. .. | 1859 |
| Row, Capt. W. S , (33rd N. I.,) Hazareebaugh, .. .. | 1854 |
| Rowlatt, Capt. E A., Principal Assist-Commr. of Assam, | 1855 |
| Ruffeeoodeen, Prince Mahomed, Russapuglah, near Tallygunge, .. .. .. .. .. .. . | 1851 |
| Rummanauth Gossain, Zemindar, Serampore, .. .. | 1857 |
| Russel, A. E., Esq., Civil service, Tirhoot, .. .. | 1847 |
| Russel, R. H., Esq, Civil service,Tipperah, .. .. | 1855 |
| Ryder, Lt. C. D., 2nd Gwalior Infy. Jhansee, .. .. | 1858 |
| | |
| SAGE,† Major Genl. W. (22nd Regt N. I ) .. .. .. | 1845 |
| Sage, R P , Esq., Chowkeedanga Collieries, Raneegunge, ... | 1859 |
| Sagore Dutt, Baboo, Merchant, Calcutta, .. .. .. | 1850 |
| Samuells,* Edwards A., Esq., Civil service, .. .. .. | 1836 |
| Sanders, Col. Arthur, Dinapore, .. .. .. | 1859 |

| | Admitted |
|---|---|
| Sandes,† Falkner C., Esq , Solicitor, .. .. .. | 1855 |
| Sandes,† M. F., Esq., .. .. .. .. .. | 1851 |
| Sandys, J U., Esq , Allahabad, .. . . .. | 1855 |
| Sapte,† Brand, Esq., Civil service, .. .. .. | 1851 |
| Sarkies, S. J., Esq., Serampore, .. .. .. .. | 1854 |
| Saubolle, C A., Esq., Nopara, Kishnaghur, .. .. | 1857 |
| Saunders,† John O'Brien, Esq., .. . .. .. | 1856 |
| Savi,† John Robert, Esq., Indigo-planter, .. .. .. | 1836 |
| Savi, Thomas, Esq., Indigo-planter, Kishnaghur, .. .. | 1851 |
| Schalch, Vernon, Esq., Civil service, Jessore, .. .. | 1859 |
| Schiller, F., Esq., Merchant, Calcutta, .. : .. | 1854 |
| Schilling, G., Esq., Talookdar, Luckunpore, Oude, .. | 1860 |
| Sconce, Honble. Archibald, Civil service, Calcutta, .. . | 1839 |
| Scott,† Dr. D., Medical service, .. . .. .. | 1852 |
| Scott, Lieut. J. F. O., Adjt. Sylhet Light Infy. Cherra, .. | 1858 |
| Scott, Lieut. Col. E. W., Inspector Genl. of Ordnance, Calcutta, . .. .. .. .. .. .. | 1859 |
| Secretary for the time being, Artillery Head Quarter Mess., | 1858 |
| Secretary Public Garden, Lucknow,.. .. .. .. | 1858 |
| Secretary Local Fund Committee, Goorgaon, .. .. | 1860 |
| Secretary Public Garden, Cawnpore, .. .. .. | 1860 |
| Secretary Public Garden, Monghyr, . .. .. .. | 1853 |
| Secretary Local Committee, Allahabad, .. .. .. | 1851 |
| Secretary Local Committee, Mynpooree, .. .. .. | 1850 |
| Secretary Horticultural Garden, Etawah, .. .. .. | 1856 |
| Secretary Public Garden, Banda, .. .. .. .. | 1855 |
| Secy Local Fund Committee, Umritsur, .. .. .. | 1859 |
| Secy Local Committee, Hummeerpore, . .. .. | 1859 |
| Seton-Karr, W. S., Esq. Civil service, Calcutta, . .. | 1859 |
| Seymour,† S. F., Esq., .. .. .. .. .. | 1853 |
| Seymour, Lieut.-Col. W. H., C. B., 2nd Dragoon Guards, Lucknow, . .. . . . .. .. . | 1860 |
| Shakespear, A. Esq., Civil service, Moradabad, .. .. | 1860 |
| Sham Churn Mullick, Baboo, Calcutta, .. .. .. | 1857 |
| Shamachurn Law, Baboo, Merchant, Calcutta, .. .. | 1855 |
| Shamchand Mittra, Baboo, Merchant, . .. .. | 1854 |
| Sharpe, the Rev. James, Chaplain, Mussooree, .. .. | 1843 |
| Shawe,† M., Esq., Civil service, .. .. .. .. | 1842 |
| Shearin, E., Esq., Merchant, Calcutta, .. .. .. | 1856 |
| Sheridan, A. J. R., Esq., M. D., Soory, . .. .. | 1860 |
| Sherriff, W., Esq., Jorrada, Jessore, .. .. .. | 1859 |
| Shib Chunder Deb, Baboo, Deputy-Collector, Calcutta, .. . | 1847 |
| Shillingford, Jos., Esq., Indigo-planter, Purneah, . | 1853 |
| Sieveking, F. H., Esq., Engineers, E. I. Railway, Bhaugulpore, .. .. .. .. .. .. | 1857 |
| Simpson,† H., Esq., Indigo-planter, . .. .. .. | 1854 |
| Simson, James, Esq., Civil service, Allahabad, .. .. | 1856 |
| Simson, D., Esq., Civil service, Bairatch, Oude, .. . | 1854 |

| | Admitted. |
|---|---|
| Sinclair,† Lieut. J. J. DeC., Artillery, .. .. .. | 1851 |
| Skinner, A., Esq., Hansi, . .. .. .. .. | 1854 |
| Skinner, C. B., Esq., Civil service, Jessore, .. .. | 1856 |
| Skinner, Lieut. R. M., (56th, N. I.)Adjutant Ramghur Irr Cav. Dorundah, .. .. .. ... .. | 1859 |
| Slade, James, Esq., Indigo-planter, Tirhoot, .. .. | 1855 |
| Smith, Adam Hume, Esq., Indigo-planter, Jessore, .. | 185[illegible] |
| Smith,† Edward, Esq., Merchant, .. .. .. .. | 1841 |
| Smith, George, Esq., Indigo-planter, Tirhoot, .. .. | 1858 |
| Smith, Jas. White, Esq., Indigo-planter, Kattullee, Kishnaghur, .. . . .. .. .. | 1854 |
| Smith, Major E., Fleetwood, (23rd Regt. N. I.) Supdt. Keddah Establishment, Dacca, .. .. .. .. | 1852 |
| Smith,† Rev Thomas, of the Free Church Institution, .. | 1857 |
| Smith, Samuel, Esq., Darjeeling, .. .. .. . | 1835 |
| Smith, Patrick, Esq., Indigo-planter, Cossimpore Facty., Fureedpore, .. .. .. .. .. | 1859 |
| Smith, J. Gow, Esq., Indigo-planter, Ruttenpore Factory, Kishnaghur, .. .. .. .. .. .. | 1859 |
| Smith, R. H., Esq., Principal Sudder Ameen, Benares, .. | 1860 |
| Smith, James, Esq., Nizamabad Factory, Azimghur, .. | 1860 |
| Smyth,† Capt. J. H., (Artillery,) .. .. .. .. | 1851 |
| Sonatun Bysack, Baboo, Calcutta, .. .. .. .. | 1858 |
| Soorauth Nauth Mullick, Baboo, Zemindar, Ishera, .. | 1858 |
| Sorodapersaud Roy, Baboo Zemindar, Chukdiggee, Burdwan, | 1857 |
| Sowerby, W., Esq., Civil Engineer, . .. .. | 1860 |
| Spears, Robert, Esq., Agriculturist, Golah Ghat, Upper Assam, .. . .. .. .. | 1855 |
| Squire, Dr. John, 3rd Seikh Infy. Gorruckpore, .. | 1860 |
| Sreekissen Sing, Baboo, Calcutta, .. .. .. .. | 1835 |
| Staig, Charles S., Esq., Supt. E. I., Coal Company, Raneegunge, .. .. . .. .. .. .. | 1859 |
| Stalkartt,‡ William, Esq., Merchant, .. .. .. | 1845 |
| Stainforth, Lieut. R. Police Corps, Gonda, Oude, .. .. | 1860 |
| Stanton, Lieut. F. S., (Engineers,) Calcutta, .. .. | 1857 |
| Steer, Charles, Esq, Civil service, Calcutta, .. .. | 1853 |
| Stephen, J., Esq., Dacca, . .. .. .. .. | 1855 |
| Sterndale, R. A. Esq., Deputy-Collector, Seonee, .. .. | 1859 |
| Sterndale, W. C., Esq., Mirzapore, .. . .. | 1856 |
| Stevens, Major J., Invalid Establist., Dehra Doon, . | 1854 |
| Stevenson,*† William, Esq., Junior, M. D., .. .. | 1834 |
| Stewart, C. B., Esq., Merchant, Calcutta, .. .. | 1854 |
| Stewart, Lt. R., Supt. of Cachar, .. .. .. .. | 1856 |
| Stewart, Wm., McAdam, Esq., Merchant, Calcutta, .. | 1851 |
| Stewart, W. M., Esq., Dulsing Serai, Tirhoot, .. .. | 1859 |
| Stewart, Lt. John, Depy. Comr. of Ordnance, Cawnpore, | 1860 |
| St. George, Sir de L. Bart. Horse-Artillery, Revenue Survey Dept. Oude, . .. .. .. .. .. | 1859 |

| | Admitted. |
|---|---|
| Story, Major-General, F. P., C. B., Cawnpore, .. .. | 1854 |
| Strachey,† Lt.-Col. R., (Engineers,) .. .. .. | 1857 |
| Stuart,† James, Esq., Merchant, .. .. .. .. | 1847 |
| Swaine, C. Esq., Indigo-planter, Contai, Tirhoot, .. .. | 1860 |
| Sumbonauth Pundit, Baboo, Pleader, Sudder Court, Calcutta, | 1853 |
| Sumboo Chunder Roy, Chowdory, Zemindar, Rungpore, .. | 1860 |
| Sutherland, Charles J., Esq., Merchant, Calcutta,.. .. | 1838 |
| Sutherland, Dr. John, Civil Surgeon, Patna, .. .. | 1859 |
| Sutherland, H. C., Esq., Civil service, Dacca, .. .. | 1860 |
| Sutish Chunder Roy, Bahadoor, Moharajah of Nuddea, Kishnaghur, .. .. . . .. .. | 1857 |
| Suttoshurn Ghosal, Rajah, Bahadoor, Calcutta, .. .. | 1856 |
| Swatman,† Col. Wm, (3rd European Regt.) . .. | 1845 |
| Swinden, T. G, Esq., Calcutta, .. . .. .. | 1855 |
| Swinhoe, William, Esq, Attorney, Calcutta, . .. | 1859 |
| | |
| Tayler W Esq., Patna, . .. . .. | 1853 |
| Taylor, G B., Esq, Benares, . .. .. .. | 1858 |
| Taylor, W. C., Esq., Assist-Comr., Southal Pergunnahs, Nya-Doomka, . .. .. .. .. .. | 1858 |
| Taylor, Villiers Esq., Civil service, Bancorrah, .. .. | 1860 |
| Teil, Thos., Esq., Merchant, Calcutta, . .. .. | 1855 |
| Terry, W., Esq., Indigo-planter, Midnapore, .. .. | 1846 |
| Thelwall, Major. J. B, (H. M. 24th Regt.) Com. 9th Punjab Infantry, Fyzabad, .. . . .. .. | 1851 |
| Theobald,† W. Esq., Barrister-at-law, .. .. .. | 1855 |
| Thomas, R. M., Esq., Solicitor, Calcutta, .. .. .. | 1849 |
| Thomas, Col. Charles Thynne, Dehra-Doon, .. .. | 1858 |
| Thomason, Lieut. C. S., H. M. Bengal Engineers, .. | 1860 |
| Thompson,† George, Esq, .. .. .. | 1856 |
| Thompson, Capt. E., Deputy-Com. Seetapore, Oude, .. | 1859 |
| Thomson, Thomas, Esq., M. D., Supt. Royal Bot. Garden, Calcutta, (*President*,) .. . .. .. | 1855 |
| Thomson, William, Esq, Merchant, Calcutta, .. . | 1848 |
| Thomson, William, Esq., Superintending-Surgeon, Dacca, | 1859 |
| Thorp,† E. C., Esq. M. D., Assist.-Surgeon, .. .. | 1857 |
| Townsend,† M. W., Esq., . . .. .. .. | 1858 |
| Travers, Lt. Col. J., Sehore, .. .. .. .. | 1850 |
| Trevor, Edward Tayler, Esq, Civil service, Cuttack, . | 1844 |
| Tripp, H. D., Esq., Indigo-planter, Salgumudea, Commercolly, . .. .. .. .. .. .. | 1852 |
| Trotter, T. C., Esq., Civil service, Patna, .. .. .. | 1856 |
| Tucker,† Henry Carre, Esq., Civil service, .. .. | 1837 |
| Tucker,† W. T., Esq., Civil service, . .. .. | 1855 |
| Tulloh, Capt. R. H. Executive Engineer, Azimghur, .. | 1860 |
| Turnbull, C. S. Esq., Silk manufacturer, Ghuttal .. .. | 1859 |
| Turnbull, G. D., Esq., Civil service, Meerut, .. .. | 1853 |

Turnbull, Lieut. A. D., (Bengal Engineers,) Supt. Genl. of Irrigation, N. W. P., Roorkee, .. .. .. 1851
Turnbull, G. L. Esq., Merchant, Calcutta, .. .. 1860
Turner,*† Thos. Jacob, Esq., Civil service, .. . 1836
Tweedie, Maurice, Esq., Indigo-planter, Buzunghaut factory, Kishnaghur, . .. .. .. 1858
Twynam, Lt. E. J. L, Executive Officer, Arracan, Akyab, 1856

Utterson,† Lieut. E. V., (27th Regt. N. I.,) .. .. 1854

Varden, A. M., Esq., Merchant, Calcutta, .. .. 1851
Vertue,† Lieut. J. S, (Madras Engineers,) .. .. 1859
Vetch,† Col. H., (54th Regt, N. I.) . .. .. 1842
Vincent, Capt. F. F., 30th Regt. N. I. China, .. .. 1859
Vincent, E. L., Esq., Civil Engineer, Monghyr, .. .. 1859
Vizianagram, His Highness the Rajah of, .. .. .. 1847
Vos, J M., Esq., Assessor of House Tax, Calcutta, .. 1847

Wagentrieber, W., *Esq., Tea-planter, Debrooghur,* .. *1857*
Walker, Alexander, Esq., Merchant, Calcutta, . . 1855
Wallace,† A., Esq., Merchant, .. .. .. .. 1843
Wallis,† J. J., Esq., Merchant, .. .. .. .. 1856
Walters,*† Henry, Esq., .. .. .. .. .. 1836
Ward, J. D., Esq., Civil service, Chittagong, .. . 1857
Warner, J. E., Esq, Indigo-planter, Kishnaghur, .. .. 1856
Warwick,† B, Esq., Merchant, .. . .. .. 1849
Waterfield, E., Esq., Civil service, Balasore, . .. 1846
Watson, Hartley, Esq, C. E, E. I. Railway, Monghyr, . 1858
Watson, John, Esq., Merchant, Calcutta, .. .. 1852
Watson,*† Robert, Esq, . .. . .. .. 1837
Wauchope, S, Esq., Civil service, Calcutta, .. .. 1848
Wavell, Wm. Esq., Civil service, Pooree, .. .. .. 1859
Wemyss, Sir John, Bart., Berhampore, .. .. .. 1859
Weskins, Charles, Esq, Merchant, Calcutta, .. .. 1854
West, C. H., Esq., Merchant, Lahore, .. * .. .. 1850
Whampoa, Mr., Merchant, Singapore, .. .. .. 1850
Whinfield, E. H., Esq., Civil service, Gya, .. .. 1860
Whitney, W. M., Esq., Merchant, Calcutta, .. .. 1860
Wienholt, W., Esq., Merchant, Calcutta, . .. 1848
Weinholt, John Esq., Merchant, Calcutta, .. .. 1859
Wight.,*† Robert, Esq., M. D., .. .. .. .. 1836
Wigram, R. J., Esq, Civil service, Jessore, .. .. 1856
Williams, Fleetwood, Esq., Civil service Meerut, . .. 1840
Williamson, Lieut. James, Commandant 18th Regt. Punjab-N. I, Moradabad, .. .. .. .. .. 1849
Williamson, Geo., Esq., Cumamara Tea Factory, Jorehaut, Assam, .. .. .. .. .. .. .. 1858

| | Admitted. |
|---|---|
| Williamson, George, Esq., Junior, Jorehaut, Upper Assam, | 1860 |
| Williams, J. Esq., Meeywar Agency, Neemuch, .. .. | 1859 |
| Williams, Fisk, Esq., Calcutta, .. .. .. .. | 1860 |
| Willis, Joseph, Esq., Merchant, Calcutta, .. .. .. | 1827 |
| Willock,† H. D., Esq., Civil service, .. .. .. | 1855 |
| Willocks, W., Esq., Deputy-Supt. Eastern Jumna Canals, Barauth, near Delhi, .. .. . .. .. .. | 1857 |
| Wilmer, Lt. L. W., 90th Lt. Infy, Seetapore, Oude, .. | 1859 |
| Wilmot, C. W., Esq., Assist. Commissioner, Sonthal Purgunnahs, Pakour *viâ* Jungypore, .. .. .. . | 1859 |
| Wilson, A. G., Esq., Deputy-Magistrate, Burhee, .. . | 1847 |
| Wilson, Thomas, Esq., Deputy Opium Agent, Ghazeepore, | 1848 |
| Wilson, Charles, Esq., Civil Surgeon, Roorkee, .. .. | 1860 |
| Wilson, Major, H. M., Cong. Hill Rangers, Bhaugulpore, | 1860 |
| Wilson, J. F. E., Esq., District Engineer, E. I., Railway, Soorool, .. .. .. .. .. .. .. | 1860 |
| Wilson, Charles, H., Esq., Merchant, Calcutta, .. .. | 1860 |
| Wilsone, C. M., Esq., Munglepore, .. .. .. . | 1853 |
| Wingrove,† E., Esq., Merchant, .. .. .. .. | 1846 |
| Wingrove,† G. W., Esq., Merchant, .. .. .. | 1856 |
| Wingfield, C. J., Esq., Civil service, Lucknow, .. .. | 1855 |
| Wintle, Charles F., Esq., Sub.-Deputy Opium Agent, Futtehpore, .. .. .. .. . .. .. | 1859 |
| Wintle, Capt. E. H. C., late 61st Regiment N. I., Calcutta, | 1860 |
| Wise, Thomas Allen, Esq., Donigara, Dacca, .. .. | 1859 |
| Wood, C. B., Esq., Merchant, Calcutta, . . | 1856 |
| Wood, J. N. T , Esq., Merchant, Calcutta, .. .. | 1854 |
| Wood, R. A., Esq., Tea-planter, Cachar, .. .. | 1858 |
| Woodcock Capt. (Bombay, Levy,) District Supt. of Oude Police, Gonda, .. .. . .. .. .. | 1860 |
| Worsley, J. T., Esq., Deputy-Magistrate, Nowada, .. | 1859 |
| Wray, G. O., Esq., Solicitor, Calcutta, .. .. . | 1857 |
| Wright, H , Esq., Shahpore, Punjab, .. . | 1854 |
| Wyatt, G. N., Esq., Indigo-planter, Peeprah, Mootehary, .. | 1860 |
| Wylie, Macleod, Esq., Clerk to the Legislative Council, Calcutta, .. .. .. .. .. .. .. | 1844 |
| Young, James H. Esq., Civil service, Burdwan, .. .. | 1857 |

# Contents.

## PART I, VOLUME XI.

### No. 1.



### No. 2.

## No. 3.

## No. 4.

# Index.

TO PART I, VOLUME XI.

## INDEX TO NAMES OF CONTRIBUTORS

## TO PART I, VOLUME XI.

# Contents.

PART II, VOLUME XI.

## No. 1.



## NO. 2.



## No. 3.



## No. 4.

# Index

## TO PART II, VOLUME XI.

*1st.* The Insured in the Society have a most satisfactory guarantee for the settlement of claims in the *large Capital of the Institution,* not merely subscribed, but actually invested, amounting to £7,50,000, of which One-half is held by the Indian Branch, and immediately available, being an amount greatly in excess of the Capital of any similar Society in India.

*2nd.* Avoiding hazardous competition the Directors of the *Universal* have adopted Tables of Premium constructed with the utmost care. The rates for India were originally prepared from the most comprehensive data, exclusively obtained by this Society from the records of the India House, and these rates have recently been carefully investigated by two of the most eminent Actuaries in London (*viz.* Messrs. Peter Hardy and Charles Jellicoe) and the result, after a laborious enquiry, has established the fact, that the present Indian rates are as moderate, with reference to the risk incurred, as is consistent with perfect security to the Assured, and to a Society which returns to them three-fourths of its profits.

*3rd.* Assurances may be effected for whole life either on a scale entitling the assured to participate in the profits of the Society, or at a lower rate of premium without such participation. Also for short periods from one to seven years, on very moderate terms.

*4th,* The profits are ascertained *each year,* and declared on the second Wednesday in May, when all those insured on the profit scale who have paid six annual premiums on their policies are entitled to participate therein.

*5th.* One-fifth of the ascertained profits of the five preceding years is divided between the Policy-holders and Shareholders--three-fourths *or seventy-five* per cent to the former, and one-fourth to the latter. The remaining four-fifths are set apart to enter into the average of the succeeding years, and thus to provide against unforeseen contingencies.

*6th.* The Assured have the option of appropriating their profits to the immediate reduction of their premiums, or as a bonus to be added to the sum assured.

*7th.* The practice of an *annual* division "distributes the profits with more regularity and justice than any other," and is in many respects preferable to triennial, or other modes of division.

*8th.* The first division of profits took place in 1840; the annual reduction of premium has averaged 44 per cent, and notwithstanding the extraordinary claims consequent upon the Indian mutiny, *a reduction of 40 per cent* was declared at the last Annual General Meeting on all Policies entitled to participate dated prior to the 9th May 1855.

*9th.* It is most important that all intending Assurers should consider well not only the rate of premium primarily charged, but also the percentage of profits actually granted (*annually* by this Office) in reduction of such premium.

10*th*. The following is an extract of the Rates of Premium for an Assurance of Company's Rupees One Thousand :—

## CIVIL.

| Age. | One Year. Half-yearly. | One Year. Quarterly. | Three Years. Half-yearly. | Three Years. Quarterly. | Five Years. Half-yearly. | Five Years. Quarterly. | Seven Years. Half-yearly. | Seven Years. Quarterly. |
|---|---|---|---|---|---|---|---|---|
| | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. |
| 20 | 11 0 | 5 8 | 11 0 | 5 8 | 11 8 | 5 12 | 12 0 | 6 0 |
| 30 | 13 8 | 6 12 | 14 0 | 7 0 | 14 0 | 7 0 | 14 8 | 7 4 |
| 40 | 16 0 | 8 0 | 16 0 | 8 0 | 16 0 | 8 0 | 16 8 | 8 4 |
| 50 | 19 0 | 9 8 | 20 0 | 10 0 | 20 0 | 10 0 | 21 8 | 10 12 |

## MILITARY.

| Age. | One Year. Half-yearly. | One Year. Quarterly. | Three Years. Half-yearly. | Three Years. Quarterly. | Five Years. Half-yearly. | Five Years. Quarterly. | Seven Years. Half-yearly. | Seven Years. Quarterly. |
|---|---|---|---|---|---|---|---|---|
| | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. | Rs. As. |
| 20 | 13 0 | 6 8 | 13 8 | 6 12 | 14 0 | 7 0 | 14 0 | 7 0 |
| 30 | 16 0 | 8 0 | 16 0 | 8 0 | 16 8 | 8 4 | 17 0 | 8 8 |
| 40 | 19 8 | 9 12 | 20 0 | 10 0 | 20 0 | 10 0 | 20 0 | 10 0 |
| 50 | 22 8 | 11 4 | 23 0 | 11 8 | 23 8 | 11 12 | 24 0 | 12 0 |

Intermediate Ages in Proportion.

## Following is an extract of WHOLE LIFE rates.

### CIVIL.

| Age. | With Profits. | | | | Without Profits. | | | |
|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | | Quarterly. | | Half-yearly. | | Quarterly. | |
| | Rs. | As. | Rs. | As. | Rs. | As. | Rs. | As. |
| 20 | 21 | 0 | 10 | 8 | 16 | 0 | 8 | 0 |
| 30 | 24 | 0 | 12 | 0 | 19 | 8 | 9 | 12 |
| 40 | 29 | 8 | 14 | 12 | 24 | 8 | 12 | 4 |
| 50 | 37 | 0 | 18 | 8 | 31 | 0 | 15 | 8 |

### MILITARY OR NAVAL.

| Age. | With Profits. | | | | Without Profits. | | | | Annual English Rates. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Half-yearly. | | Quarterly. | | Half-yearly. | | Quarterly. | | | | |
| | Rs. | As. | Rs. | As. | Rs. | As. | Rs. | As. | £. | s. | d. |
| 20 | 23 | 8 | 11 | 12 | 18 | 0 | 9 | 0 | 1 | 18 | 8 |
| 30 | 27 | 0 | 13 | 8 | 22 | 8 | 11 | 4 | 2 | 8 | 10 |
| 40 | 31 | 8 | 15 | 12 | 26 | 8 | 13 | 4 | 3 | 3 | 0 |
| 50 | 38 | 8 | 19 | 4 | 32 | 0 | 16 | 0 | 4 | 5 | 6 |

11*th*. On return of an Insurer to Europe, either for *a temporary or permanent residence,* and *without reference to the state of health, subject however to notice being given at the London Office, the Premium is reduced to the English rate, corresponding with the age when the Assurance was originally effected;* and in the case of participating Policies, the profits are allowed on the *English*

*rate of Premium*, whereby Indian Assurers can continue their Policies in England on *most favorable terms.*

12*th*. Military Officers holding Civil appointments are allowed to subscribe at the Civil rate of premium, *on notice being given to the Agents of the Society.*

13*th*. Premiums are payable either annually, half-yearly, or quarterly, and, on certain conditions *monthly* and a grace of 28 days is allowed for such payments, and claims are paid should death occur with in that period. Policies can be *revived* within three months after the premium has become due on proof of health and payment of fine, and within six months at the discretion of the Board.

14*th*. Policies for the whole term of life, which have been in force for the full period of five years, will be purchased by the Society, or loans granted thereon to the extent of two-thirds of their estimated value.

15*th*. Medical referees are remunerated by the Society by a fee of *Sixteen Rupees* on proposals for assurances *not under Co.'s Rs.* 2,500 :—but for any less sum the fee to be settled by the applicant.

16*th*. At the period of the last annual Valuation, the Assets of the Society were ascertained to be upwards of £743,000. The amount of Policies in force about £2,200,000, and the annual Income upwards of £120,000.

Tables of Rates, Forms and Instructions for effecting Assurances, can be obtained on application to the Secretaries in Calcutta, or to the Local Director at Allahabad, or to any of the Agents of the Society.

BRADDON AND CO.
*Agents and Secretaries.*

CALCUTTA, No. 14, STRAND,
*December* 1860.

## Indian Rates of the Universal Life Assurance Society.

### TABLE No. 1.—CIVIL.

Annual Premium required for the Assurance of 1,000 Rs. for periods from One to Seven Years, on the Lives of Persons in the Civil Service and others not exposed to the hazards of Military and Maritime occupations *without participation* in the Profits of the Society.

| Age. | One year. | Two years. | Three years. | Four years. | Five years. | Six years. | Seven years. | Age. |
|---|---|---|---|---|---|---|---|---|
| 18 | 21 | 21 | 22 | 22 | 23 | 23 | 23 | 18 |
| 19 | 22 | 22 | 22 | 22 | 23 | 23 | 24 | 19 |
| 20 | 22 | 22 | 22 | 23 | 23 | 24 | 24 | 20 |
| 21 | 22 | 22 | 23 | 23 | 24 | 24 | 24 | 21 |
| 22 | 23 | 23 | 24 | 24 | 24 | 24 | 24 | 22 |
| 23 | 23 | 24 | 24 | 24 | 24 | 24 | 25 | 23 |
| 24 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 24 |
| 25 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 25 |
| 26 | 24 | 24 | 25 | 25 | 26 | 26 | 27 | 26 |
| 27 | 25 | 25 | 26 | 26 | 27 | 27 | 28 | 27 |
| 28 | 26 | 26 | 27 | 27 | 28 | 28 | 28 | 28 |
| 29 | 27 | 27 | 28 | 28 | 28 | 28 | 28 | 29 |
| 30 | 27 | 27 | 28 | 28 | 28 | 28 | 29 | 30 |
| 31 | 28 | 28 | 28 | 28 | 29 | 29 | 29 | 31 |
| 32 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 32 |
| 33 | 28 | 28 | 29 | 29 | 30 | 30 | 30 | 33 |
| 34 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 34 |
| 35 | 30 | 30 | 30 | 30 | 31 | 31 | 31 | 35 |
| 36 | 30 | 30 | 30 | 31 | 31 | 32 | 32 | 36 |
| 37 | 31 | 31 | 31 | 31 | 32 | 32 | 32 | 37 |
| 38 | 31 | 31 | 32 | 32 | 32 | 32 | 32 | 38 |
| 39 | 31 | 32 | 32 | 32 | 32 | 32 | 32 | 39 |
| 40 | 32 | 32 | 32 | 32 | 32 | 32 | 33 | 40 |
| 41 | 32 | 32 | 32 | 32 | 33 | 33 | 34 | 41 |
| 42 | 32 | 32 | 32 | 33 | 34 | 34 | 35 | 42 |
| 43 | 33 | 33 | 34 | 34 | 35 | 35 | 36 | 43 |
| 44 | 34 | 34 | 35 | 35 | 35 | 36 | 36 | 44 |
| 45 | 34 | 35 | 35 | 36 | 36 | 37 | 38 | 45 |
| 46 | 35 | 35 | 36 | 36 | 36 | 37 | 39 | 46 |
| 47 | 36 | 36 | 36 | 37 | 38 | 39 | 40 | 47 |
| 48 | 36 | 36 | 37 | 38 | 39 | 40 | 40 | 48 |
| 49 | 37 | 38 | 39 | 39 | 40 | 40 | 42 | 49 |
| 50 | 38 | 39 | 40 | 40 | 40 | 41 | 43 | 50 |
| 51 | 40 | 40 | 40 | 41 | 42 | 43 | 44 | 51 |
| 52 | 40 | 41 | 42 | 43 | 44 | 44 | 45 | 52 |
| 53 | 42 | 43 | 44 | 44 | 44 | 46 | 47 | 53 |
| 54 | 43 | 44 | 44 | 45 | 46 | 47 | 48 | 54 |
| 55 | 44 | 45 | 46 | 47 | 48 | 48 | 48 | 55 |
| 56 | 45 | 46 | 47 | 48 | 48 | 49 | 50 | 56 |
| 57 | 46 | 48 | 48 | 49 | 50 | 51 | 52 | 57 |
| 58 | 48 | 48 | 50 | 51 | 52 | 52 | 54 | 58 |
| 59 | 49 | 50 | 51 | 52 | 54 | 56 | 56 | 59 |
| 60 | 51 | 52 | 52 | 54 | 56 | 58 | 60 | 60 |
| 61 | 52 | 53 | 55 | 56 | 59 | 61 | 64 | 61 |
| 62 | 55 | 56 | 57 | 60 | 62 | 66 | 70 | 62 |
| 63 | 58 | 60 | 61 | 64 | 66 | 71 | 76 | 63 |
| 64 | 62 | 64 | 66 | 68 | 71 | 77 | 84 | 64 |
| 65 | 67 | 69 | 72 | 75 | 77 | 84 | 91 | 65 |

*⁂ Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Table No. 1, Example.—A person aged 30, may by paying 27 Rs. secure 1,000 Rs. to his representatives, if his death should occur within *one* year; if within *five* years, by paying 28 Rs. annually, and if within *seven* years, by paying 29 Rs. per annum.

# Indian Rates of the Universal Life Assurance Society.

## TABLE No. 2.—MILITARY AND NAVAL.

Annual Premiums required for the Assurance of 1,000 Rs. for periods from One to Seven years, on the Lives of Persons exposed to the hazards of Military and Maritime occupations, *without participation* in the Profits of the Society.

| Age. | One year. | Two years. | Three years. | Four years. | Five years. | Six years. | Seven years. | Age |
|---|---|---|---|---|---|---|---|---|
| 18 | 25 | 25 | 25 | 26 | 26 | 27 | 27 | 18 |
| 19 | 26 | 26 | 26 | 27 | 27 | 28 | 28 | 19 |
| 20 | 26 | 27 | 27 | 28 | 28 | 28 | 28 | 20 |
| 21 | 27 | 28 | 28 | 28 | 28 | 28 | 28 | 21 |
| 22 | 28 | 28 | 28 | 28 | 28 | 29 | 29 | 22 |
| 23 | 28 | 28 | 28 | 29 | 29 | 30 | 30 | 23 |
| 24 | 28 | 28 | 28 | 29 | 29 | 30 | 30 | 24 |
| 25 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 25 |
| 26 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 26 |
| 27 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 27 |
| 28 | 30 | 31 | 31 | 32 | 32 | 32 | 32 | 28 |
| 29 | 31 | 32 | 32 | 32 | 32 | 33 | 33 | 29 |
| 30 | 32 | 32 | 32 | 32 | 33 | 34 | 34 | 30 |
| 31 | 32 | 32 | 33 | 33 | 34 | 35 | 35 | 31 |
| 32 | 32 | 33 | 34 | 34 | 34 | 36 | 36 | 32 |
| 33 | 33 | 34 | 35 | 35 | 36 | 36 | 36 | 33 |
| 34 | 34 | 35 | 36 | 36 | 36 | 36 | 37 | 34 |
| 35 | 35 | 36 | 36 | 36 | 37 | 37 | 38 | 35 |
| 36 | 36 | 36 | 36 | 37 | 37 | 38 | 38 | 36 |
| 37 | 36 | 37 | 37 | 38 | 38 | 39 | 39 | 37 |
| 38 | 37 | 38 | 38 | 38 | 39 | 39 | 40 | 38 |
| 39 | 38 | 39 | 39 | 39 | 40 | 40 | 40 | 39 |
| 40 | 39 | 39 | 40 | 40 | 40 | 40 | 40 | 40 |
| 41 | 40 | 40 | 40 | 40 | 40 | 41 | 41 | 41 |
| 42 | 40 | 40 | 40 | 41 | 41 | 42 | 42 | 42 |
| 43 | 40 | 40 | 41 | 41 | 42 | 42 | 43 | 43 |
| 44 | 41 | 41 | 41 | 42 | 43 | 43 | 44 | 44 |
| 45 | 42 | 42 | 42 | 43 | 43 | 44 | 44 | 45 |
| 46 | 43 | 43 | 43 | 44 | 44 | 44 | 44 | 46 |
| 47 | 43 | 44 | 44 | 44 | 44 | 45 | 45 | 47 |
| 48 | 44 | 44 | 44 | 45 | 45 | 46 | 46 | 48 |
| 49 | 44 | 45 | 45 | 46 | 46 | 47 | 48 | 49 |
| 50 | 45 | 46 | 46 | 47 | 47 | 48 | 48 | 50 |
| 51 | 46 | 47 | 47 | 48 | 48 | 48 | 49 | 51 |
| 52 | 47 | 48 | 48 | 48 | 49 | 50 | 50 | 52 |
| 53 | 48 | 49 | 49 | 49 | 50 | 51 | 52 | 53 |
| 54 | 49 | 49 | 50 | 51 | 52 | 52 | 52 | 54 |
| 55 | 50 | 51 | 51 | 52 | 52 | 53 | 53 | 55 |
| 56 | 51 | 52 | 52 | 53 | 53 | 54 | 55 | 56 |
| 57 | 52 | 53 | 53 | 54 | 55 | 56 | 56 | 57 |
| 58 | 53 | 54 | 55 | 56 | 56 | 57 | 58 | 58 |
| 59 | 54 | 55 | 56 | 57 | 58 | 60 | 60 | 59 |
| 60 | 56 | 56 | 57 | 59 | 60 | 62 | 64 | 60 |
| 61 | 57 | 58 | 59 | 60 | 63 | 65 | 68 | 61 |
| 62 | 60 | 60 | 61 | 64 | 66 | 69 | 73 | 62 |
| 63 | 62 | 64 | 65 | 68 | 69 | 75 | 80 | 63 |
| 64 | 66 | 68 | 70 | 72 | 74 | 80 | 87 | 64 |
| 65 | 71 | 73 | 76 | 78 | 80 | 87 | 94 | 65 |

**** Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

Table No. 2, Example.—A person aged 30, may, by paying 32 Rs. secure 1,000 Rs. to his representatives, if his death should occur within *one* year; if within *five* years by paying 33 Rs. annually, and if within *seven* years by paying 34 Rs. per annum.

# UNIVERSAL LIFE ASSURANCE SOCIETY.

## WHOLE LIFE.

| Age | CIVIL. | | MILITARY AND NAVAL. | | ENGLISH RATES. | | Age |
|---|---|---|---|---|---|---|---|
| | TABLE No 3. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe. | TABLE No. 5. Annual Premiums required for the Assurance of 1,000 Rs. *without participation in profits, but with reduction of Premium on return to Europe* | TABLE No 4 Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe. | TABLE No. 6 Annual Premiums required for the Assurance of 1,000 Rs. *without participation in profits, but with reduction on Premium on return to Europe.* | Annual Premium for assuring £100, for the whole of life, with participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 3 and 4. | Annual Premium for assuring £100, for the whole of life, without participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 5 and 6. | |
| 18 | 41 | 31 | 45 | 34 | 1 17 2 | 1 13 6 | 18 |
| 19 | 42 | 32 | 46 | 35 | 1 17 11 | 1 14 2 | 19 |
| 20 | 42 | 32 | 47 | 36 | 1 18 8 | 1 14 10 | 20 |
| 21 | 43 | 33 | 48 | 37 | 1 19 6 | 1 15 7 | 21 |
| 22 | 43 | 34 | 49 | 38 | 2 0 5 | 1 16 5 | 22 |
| 23 | 44 | 35 | 49 | 39 | 2 1 4 | 1 17 3 | 23 |
| 24 | 44 | 36 | 50 | 40 | 2 2 3 | 1 18 1 | 24 |
| 25 | 45 | 36 | 51 | 41 | 2 3 3 | 1 19 0 | 25 |
| 26 | 46 | 37 | 51 | 42 | 2 4 4 | 1 19 11 | 26 |
| 27 | 46 | 38 | 52 | 43 | 2 5 5 | 2 0 11 | 27 |
| 28 | 47 | 38 | 53 | 44 | 2 6 7 | 2 2 0 | 28 |
| 29 | 48 | 39 | 54 | 45 | 2 7 8 | 2 2 11 | 29 |
| 30 | 48 | 39 | 54 | 45 | 2 8 10 | 2 4 0 | 30 |
| 31 | 49 | 40 | 55 | 46 | 2 9 11 | 2 5 0 | 31 |
| 32 | 50 | 41 | 56 | 46 | 2 11 0 | 2 5 11 | 32 |
| 33 | 51 | 42 | 57 | 47 | 2 12 3 | 2 7 1 | 33 |
| 34 | 52 | 43 | 58 | 47 | 2 13 7 | 2 8 3 | 34 |
| 35 | 53 | 43 | 58 | 47 | 2 14 11 | 2 9 6 | 35 |
| 36 | 54 | 45 | 59 | 49 | 2 16 5 | 2 10 10 | 36 |
| 37 | 55 | 46 | 60 | 50 | 2 18 0 | 2 12 3 | 37 |
| 38 | 56 | 47 | 61 | 51 | 2 19 7 | 2 13 8 | 38 |
| 39 | 58 | 48 | 62 | 52 | 3 1 3 | 2 15 2 | 39 |
| 40 | 59 | 49 | 63 | 53 | 3 3 0 | 2 16 9 | 40 |
| 41 | 60 | 51 | 64 | 54 | 3 4 9 | 2 18 4 | 41 |
| 42 | 62 | 52 | 65 | 55 | 3 6 6 | 2 19 11 | 42 |
| 43 | 63 | 53 | 66 | 56 | 3 8 3 | 3 1 6 | 43 |
| 44 | 65 | 54 | 68 | 57 | 3 10 2 | 3 3 2 | 44 |
| 45 | 66 | 55 | 69 | 58 | 3 12 2 | 3 5 0 | 45 |
| 46 | 67 | 57 | 70 | 60 | 3 14 5 | 3 7 0 | 46 |
| 47 | 69 | 58 | 72 | 61 | 3 16 9 | 3 9 1 | 47 |
| 48 | 70 | 60 | 73 | 62 | 3 19 4 | 3 11 5 | 48 |
| 49 | 72 | 61 | 75 | 63 | 4 2 3 | 3 14 1 | 49 |
| 50 | 74 | 62 | 77 | 64 | 4 5 6 | 3 17 0 | 50 |
| 51 | 76 | 65 | 79 | 67 | 4 9 1 | 4 0 3 | 51 |
| 52 | 79 | 68 | 81 | 70 | 4 12 10 | 4 3 7 | 52 |
| 53 | 81 | 71 | 83 | 73 | 4 16 11 | 4 7 3 | 53 |
| 54 | 84 | 74 | 86 | 76 | 5 1 2 | 4 11 1 | 54 |
| 55 | 87 | 76 | 89 | 78 | 5 5 10 | 4 15 3 | 55 |
| 56 | 89 | 79 | 91 | 81 | 5 10 10 | 4 19 9 | 56 |
| 57 | 92 | 81 | 94 | 83 | 5 16 2 | 5 4 7 | 57 |
| 58 | 96 | 84 | 98 | 86 | 6 1 10 | 5 9 8 | 58 |
| 59 | 99 | 86 | 101 | 88 | 6 7 7 | 5 14 10 | 59 |
| 60 | 103 | 88 | 105 | 90 | 6 13 2 | 5 19 11 | 60 |
| 61 | 108 | 94 | 110 | 96 | 6 18 0 | 6 4 3 | 61 |
| 62 | 113 | 99 | 115 | 101 | 7 4 1 | 6 9 8 | 62 |
| 63 | 118 | 104 | 120 | 106 | 7 9 11 | 6 15 0 | 63 |
| 64 | 124 | 109 | 126 | 111 | 7 16 7 | 7 1 0 | 64 |
| 65 | 131 | 114 | 133 | 116 | 8 3 7 | 7 7 3 | 65 |

*** *Premiums are received in half-yearly or quarterly payments for the convenience of the Assured, but in case of lapse the full premium of the current year will be charged.*

In the event of the parties whose lives are Assured returning, to reside in Europe they will be reduced to the English rates from the date when their premiums first fall due after arrival, such reduction will only be allowed upon their furnishing satisfactory proof to the Directors of the exact date of their return, and their Policies must be forwarded to the Office to receive an Endorsement prohibiting their departure from Europe without the previous written consent of the Directors, and all such Assurances will be void if the parties whose lives are Assured shall go beyond the limits of Europe without the said permission shall have been first obtained, and such premium paid as in the opinion of the Managing Committee or Directors will Correspond with the extra risk incurred.

Parties assured in Company's Rupees in India, who may determine on paying their future premiums in England, will be required to pay them at the fixed rate of Exchange of Two Shillings per Company's Rupee; and in the event of such assurance becoming a claim payable in England, the sum assured will be paid at the same fixed rate of Exchange of Two Shillings per Company's Rupee.